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ROCKS and MINERALS

Vol. 6. No. 4. DECEMBER, 1931 Whole No. 22

—*Courtesy of Ramon Conover.*
Franklin, N. Z., Zinc Mines. Note Shaft on right.

Featured in This Issue

The Preparation of Micro Mounts.
By L. C. Wills, M. D.

The Significance of Van Hise Rock.
By Frederick Shepherd.

A NON-TECHNICAL MAGAZINE
—ON—
MINING · PROSPECTING · GEOLOGY · MINERALOGY

THE BULLETIN BOARD

Merry Christmas and a Happy New Year

To all readers and friends of ROCKS AND MINERALS. May the New Year prosper you abundantly, socially and financially is our sincere wish.

ROCKS AND MINERALS MONTHLY FUND

Founded by William C. McKinley of Peoria, Illinois

As soon as $5,000 has been contributed ROCKS AND MINERALS *will come out monthly without any increase in subscription rates.*

Those who have been contributing to the Monthly Fund, to have the magazine come out as a monthly, will be gratified to know that the Fund is growing. A separate account is kept in the bank of this Fund and interest is paid upon the balances.

Besides a few larger gifts, the Fund has added to through those who have written the Editor for information, and enclosed a small Honorarium for the trouble they were putting him to, and by others, who in ordering books or minerals, or in renewing subscriptions, have added an extra amount to their check with requests to place this extra amount to the Fund.

We hope the Fund may eventually reach the $5,000 necessary to make the magazine a monthly, when we will try the further experiment of issuing ROCKS AND MINERALS each month.

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A NON-TECHNICAL MAGAZINE
—ON—
MINING—PROSPECTING—GEOLOGY—MINERALOGY

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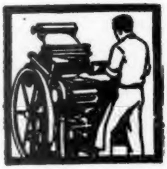


DECEMBER 1931

The Preparation of Micro Mounts

—*By*—

L. C. WILLS, M. D.
Philadelphia, Pa.

Microscopic mineralogy offers to the earnest student a veritable fairyland of daintiness, an ever changing variety and novelty of form, perfection and delicacy of structure, gorgeous and startling color schemes and effects, affording an unfailing source of wonderment, enjoyment and delight. Those interested in this study become enthusiastic in having a world of such magnitude, variety and possibilities opened to them and once this interest is definitely founded, it is continued throughout their life and seldom wanes, even though they may be handicapped by some physical infirmity in their advancing years.

The first reference to the observation of minute crystal forms was made in a very old book entitled "Micrographia of Minute Bodies Made by Magnifying Glasses", written by Robert Hooke and printed in London, England, in 1667. Among his observations of minute insects, plants, etc., he mentions observing minute, isolated forms in cavities in flint. From his drawing, a wood cut, there are easily identified as quartz crystals, but from his lack of knowledge he was unable to identify them. (see Plate No. 3). From that period to the later part of the past century no further information has been found showing any activity along microscopic study of minerals. While there may have been individuals who were interested in the micro study of minerals, they have left no definite record of their activities, such as mounts, slides, etc., on which they placed their names, which, unless destroyed, eventually are left to museums or come into the hands of successive collectors.

The first definite record of careful, classified collecting of microscopic material and the mounting of specimens on glass slides or in boxes, begins with the activities of the Rev. George G. Rakestraw and Mr. George W. Fiss, in the later part of 1870. Which of these gentlemen was the first to start mounting mineral specimens is in doubt, but both began collecting about the same time, independently and unknown to each other.

Judging from many specimens they mounted that I have seen, and also from the opinion of those who knew them intimately, apparently their main idea was the collecting of as great a variety of

minerals as possible, that would not only please the eye from the standpoint of their intrinsic beauty, attractiveness and delicacy, but, would also create a greater interest in the many varying crystal forms, thereby eventually developing a broader knowledge of the unlimited number of species and varieties, that only by sincere study could be revealed and would be appreciated.

From the information I have been able to obtain, it appears they were responsible for the inception and introduction of micro mounts and the first to take an active interest in this phase of mineralogy from a non-scientific standpoint, and to them is due the credit for the rapid spread of this interesting study among others. The results of their observations, experiments and study over a period of many years, were passed on to those likewise interested, and have proven invaluable to successive collectors.

The first mounts made by Mr. Fiss were on glass slides 3x1 inch on which was cemented a small, circular, thin brass cell about 1/2 inch in diameter and 3/16 inch in height, using asphaltum as the adhesive. Each cell was fitted with a brass cap to keep out the dust. Mr. Henry Garrett, of White Horse, Pa., and Dr. J. C. Green, of West Chester, Pa., about this time were also mounting pieces of minerals, using a hard rubber or composition ring about 5/8 inch diameter and varying in height from 1/16 to ¼ inch depending upon the thickness of the specimen. The ring was cemented to the glass by fish-glue, or asphaltum, and built up to the desired height to suit each specimen. The specimen was cemented into position by various adhesives, and finally a thin cover glass was cemented on to the top. When dry, the slide was placed on a turn-table, and colored enamels used to finish its appearance. Similar methods of decoration and mounting are occasionally obtained from some manufacturers today, but not so elaborate. The glass slide type of mounting restricted the collector to using only very small fragments or pieces of minerals, the size being governed by the height and diameter of the cell used. As the cells were hermetically sealed, eventually the inside of the cover glass became fogged, and it was impossible to clean them without removing the cover glass and replacing with a new one. Other types of slides consisting of wood, ivory, bone, hard rubber, or vulcanite, were used by collectors—following the same methods of preparing the cells as on glass. In the latter part of 1890, a Mr. Van Sickle made a slide of composition material similar to hard rubber, the slide and cell being molded in one piece. A milled edge cap molded of the same material was used for a cover and fitted tightly on the cell. This type of cell is still used by some of the older collectors, is very satisfactory for small flat pieces, and is used mainly for botanical or biological specimens, but not for minerals. This slide type of mounting of mineral specimens was eventually discarded for the more convenient and satisfactory paper box, this proving vastly superior for its general utility, handiness, and uniform character regarding size, height, length and width.

In the later part of 1870, Mr. Rakestraw adopted the paper box as a medium for the permanent mounting of mineral specimens, finding them more advantageous for keeping specimens, than the glass slides. The first boxes used by him were of the type used by jewelers to keep rings in. After some experimenting he had boxes made to suit his personal requirements. The bottom and lid were covered inside and out with black paper of a dull finish. A white label was placed on the top of the lid for data. The adoption of the paper box marked a change in the size, as well as the type of mineral specimen to be mounted. Specimens showing a group of crystals or a cavity could now be mounted without destroying the crystal formation, or breaking it into small pieces, and also afforded additional and better protection from falls, dust or handling. Mr. Fiss began using boxes in the early eighties.

Most of the collectors contemporary with Rakestraw and Fiss, have passed away, their collections left to others who carry on the interest. Many collectors a generation younger, are still active and have made notable collections.

When one considers how little interest in the past has been taken in micro material and even today, how little is shown, it is gratifying to see the increased interest, especially in the younger collectors. One can note with sadness the irreparable loss to collectors, as well as to science, of interesting and valuable material that was thrown on the dumps

or discarded by the collector as uninteresting, and of little or no value, because the crystals were so small they could not be easily seen, which material in the great majority of instances, was of far greater beauty and interest—had it been known—than the hand specimens so eagerly sought after.

Many mines and quarries, famous for the fine material obtained from them, that have been abandoned for many years, were active during the period of 1880 to 1910. These afforded the active collector of that time, material of unusual beauty and interest, which is quite different from that obtained today and, in many instances, of such fine quality, beauty or interest as to be greatly desired, but impossible to obtain today, unless one is fortunate enough to purchase some old collection from these localities. On the back of many hand specimens from noted localities will be found magnificent micro material which can be easily removed without damage to the specimen, and many hand collectors will let a micro friend get small fragments from his specimens, once he is shown it can be done without damaging them.

Rev. George Gilbert Rakestraw

It was during his pastorate in Cornwall, Pa., in 1878 he became interested in the minerals then being obtained from the mine, which attracted his attention and he began to take a definite interest in their collection and study. He took advantage of the opportunities about him and acquired a very choice representation of the various minerals from that locality, these becoming the nucleus of a very extensive and carefully selected collection.

In 1888 Mr. George L. English was invited to give a lecture before the Brooklyn Institute of Arts and Sciences, selecting as his subject "The Utah Copper Arsenates and Associated Minerals". At the conclusion of his talk, Mr. Rakestraw, who had accompanied him, showed a series of micro mounts of the minerals from the Tintic District. These being the first micro specimens seen by the members, they attracted unusual attention and aroused intense enthusiasm among several of the members, who, afterwards, began the collecting and mounting of micro specimens.

So far as known, Mr. Rakestraw was the first to adopt a rectangular paper box for the mounting of micro specimens. Some years later, the members of the Brooklyn Society, who had also adopted the paper box, did not take kindly to the rectangular shaped box, attempted to "standardize" a box one inch square by 11/16 inch deep, which they adopted, and is used mainly by those residing within this district, but was not universally adopted by other collectors. These boxes were at the time given the name of "Rakestraws" and are still known as such among the older collectors.

In 1895 he had a very large number of unusually fine micro mounts in his collection, representing a great variety of species, which at that time was the most extensive one known. In 1897 he sold to Mr. C. S. Bement many of his choice specimens, these becoming the nucleus of his later extensive collection.

He was generous in helping and encouraging others. Those who recall him will remember the great pleasure he took in aiding those similarly interested, giving them duplicates from his collection, these becoming in many instances the beginning of other collections. He left no records of his activities, other than his collection, which is scattered among a few individuals.

A favorite expression of his when discussing the beauties of micro specimens was, "The Good Book says, the hairs of your head are all numbered, but these

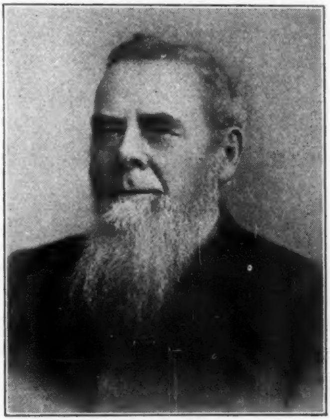


PLATE 1
REV. GEORGE GILBERT RAKESTRAW

things we see in minute crystals are infinitely smaller than the hairs of your head, and show the infinite care of the Creator in their beauty and hidden perfection".

George Washington Fiss

Very little information is known regarding his early collecting, but accurate data is furnished of his activities in the late seventies and thereafter. He was the first to take special pains in shaping corks for specimens and to blacken them.

Much of his collection was obtained through the kindness of Mr. C. S. Bement, who permitted him to take fragments from the hand specimens in his collection. So far as known, he did no personal collecting, but specimens were occasionally purchased from Mr. English and Dr. Foote. In 1897 Mr. Bement began to take an active interest in micro minerals and made numerous purchases of the choicest material from every available locality, which Mr. Fiss mounted, giving him the best mounts and retaining the next best for himself. This arrangement continued until 1911, when he sold his collection to Mr. Fiss, who took from it the best mounts, replacing them with his duplicates. He sold Mr. Bement's collection, consisting of 2300 mounts, representing 475 species, to Mr. A. F. Holden in 1912, who presented it to Harvard University. Duplicates of these specimens were given to those interested in micro mounts, these becoming in many instances the nucleus of other collections.

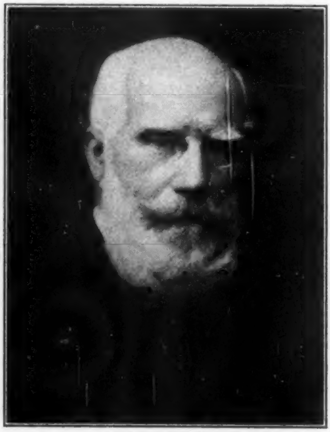


PLATE 2
GEORGE WASHINGTON FISS

His extensive collection is considered one of the finest, if not the best, and is noted for the painstaking care, neatness and skill in mounting the specimens, selected of the choicest material obtainable. Only those who have been fortunate enough to have seen his superb collection, can realize the marvelous beauty of the great majority of his mounts, and the unusual number of exceedingly rare minerals represented.

He was kind, generous and courteous. He was continuous in his microscopic activities until a few days prior to his death in 1925, in his 91st year.

His microscope, accessories and revolving table were presented to the Academy of Natural Sciences of Philadelphia, Pa., by Mr. F. J. Keeley, who retained his collection.

Microscopic, or micro specimens, as generally termed by those interested in their study, invariably depend for their interest upon minute crystal or crystalline forms requiring the aid of suitable magnification for their observation, the size of the specimen being secondary to the perfection of the crystal development.

Usually crystals suitable for micro mounts are too minute to be readily or easily observed with normal eyesight, and it is impossible to see their exquisite delicacy without the aid of a microscope, and only when a binocular type producing the stereoscopic effect is used, can their superlative beauty be appreciated and enjoyed. As a rule, minute crystals exhibit in the maximum degree the most perfect development of individual form, smoothness of surface, sharpness and brilliancy of faces, purity of color, transparency, flawlessness, and fullness of beauty, unsurpassed by hand specimens.

The mineralogist who looks through a small hand magnifier at minute crystals and believes he is seeing all there is to be seen on the specimen, is sadly mistaken, for only when the specimen, properly mounted and illuminated, is examined through a suitable microscope, will the full beauty and interesting points be revealed. Then he will find and acknowledge, that truly has it been said, that

perfection will and can only be found in the small things.

Nowhere can crystals be observed or obtained in such perfection of form as those developing in crevices or cavities, where protection has been given them when the mass rock was broken, with the danger of subsequent damage when removed from the specimen, greatly eliminated, yet, in spite of the greatest care in handling, seldom is it possible to eventually place them in a mineral cabinet without some chipping or blemish occurring. Even then, there is constant danger of their being damaged by careless handling, falls, etc. All of these possibilities for harm are removed to such an extent in micro mounts properly boxed, as to be virtually negligible. Truly may it be said that, once a specimen is obtained, it will last indefinitely.

The identification of micro specimens depends mainly on the form, habit, and modification of the crystals. Color is often a clue to the identification of a mineral, but is undependable. Colors, or lack of them, are often seen in box mounts, which may be beyond the experience of a worker on large specimens. Therefore, a broad working knowledge of crystallography and crystal habits, becomes necessary and is essential to the accurate identification of micro mounts. Cleavage and streak can sometimes be observed, also association with other minerals, and the character of the rock matrix will at times aid identification. Large crystals, when on the same specimen will afford accurate identification, as the usual methods of determination, such as cleavage, fracture, hardness, specific gravity, luster, color, diaphaneity, association, surface etching, blow pipe tests, solubility, fusibility and chemical analysis, can then be used.

One advantage of studying minerals under a microscope is the total absence of surrounding objects to distract attention from the specimen. In looking through a microscope you are looking down onto a surface, usually of the same character within the field of vision, whereas, in observing a hand specimen this condition can never occur.

One of the serious drawbacks to the study of micro specimens is the expense of a good binocular microscope and accessories. This expense, while it may be considerable, according to the type of microscope selected, and whether new or second hand, is virtually the heaviest expense one will be called upon to meet, unless rare and high priced micro material is purchased. There is so much micro material to be had by personal collecting, exchange or through purchase from some dealer, that the expense is light compared to the purchase of hand specimens. While the price of micro material is about the same as hand specimens, when one considers the number of mounts that on the average will be obtained from a specimen, it will reduce the actual expense to but a few cents per mount, and by the time the specimens are broken up and mounted and the duplicates exchanged or sold, the collection of material will be found to be inexpensive and not to be compared with the expense of obtaining hand specimens of the same character or of the same quality. Consequently, when more is known about this most fascinating phrase of mineralogy, the growth in micro interest and the collecting of material will naturally follow.

To those, desirous of developing a mineral collection where all of the disadvantages of hand specimen collecting are eliminated to a major degree, as well as to the conservation of space, the study of the innumerable and varying forms of minute crystals, is recommended. Good eyesight is essential for the continuous enjoyment of this fascinating phase of mineralogy, as the observer is constantly confronted with brilliant illumination in the visual field of the microscope, which varies in intensity according to the light source employed, and especially to the character of the crystal surfaces present, and the absorption and

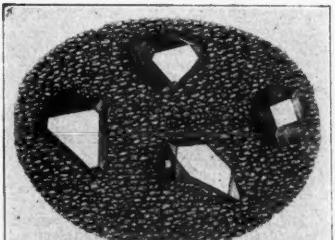


PLATE 3
Quartz crystals in cavities in flint.
From Hooke, 1667.

reflecting value of the background on which they are attached, as a contrasting medium.

Glare is usually the most annoying factor to be considered and this is due to the reflection of light from the highly polished crystal faces when in certain positions, so that all color value is lost. The glare remains constant while the crystal is in that position, which frequently is almost impossible to eliminate completely, though it may be modified to a certain extent by changing the position of the crystal. Shadows and reflections must also be considered and frequently are very confusing. I have a columbite crystal which in one position apparently is transparent and of a deep green color, this deception being due to its highly polished surfaces, which are covered with a very thin coating of a greenish hue, the reflection of light at a certain angle producing the semblance to transparency, though the mineral is opaque and black in color.

Many minerals do not show crystals other than in minute size, and it is surprising to find how very few minerals fail to show crystallization of small forms suitable for microscopic examination. In the great majority of minerals where crystal aggregates are generally found in hand specimens, perfectly developed crystals will be found in micro specimens. Large crystals are seldom perfect, usually being rough, or etched on one or more of their faces, generally are opaque or translucent, seldom present flawless forms and often the coloring pigment is so intense as to disguise the true color value, which can only be observed in minute crystals or very thin fragments. I have in my collection specimens of torbernite, pyromorphite, proustite, azurite, malachite, cuprite, apophyllite, prehnite, heulandite, albite, titanite, rutile, octahedrite and many other species, where the crystals are absolutely transparent, of beautiful color, perfect in form and flawless, whereas, these same minerals in hand specimens, rarely show this general perfection of development and attractiveness.

A great variety of odd and very delicate forms are constantly seen. Crystals completely developed, perfect in growth, very often doubly terminated, are very frequently observed in micro specimens. Crystals showing phantom forms are occasionally found. Crystals with inclusions of other minerals are common. Calcite is noted for the frequency which other minerals are enclosed within it, among those observed being pyrite, copper, crocoite, malachite, chalcotrichite and others. Quartz is also another mineral in which inclusions are common, such as octahedrite, dioptase, parisite, gold, descloizite, etc. Freak, or odd forms occur more frequently than is supposed, for instance—quartz enclosing numerous rod-like crystals of rutile, many of them capped by minute crystals of hematite, giving them the appearance of a tack. Pachnolite, capped with a tabular crystal, probably the same material, giving them the appearance of a nail—the so-called "nail-head" type of crystal. Recently I received a specimen of malachite from the Transvaal, showing a primary growth of very slender, hair-like crystals of malachite, the tips of many of these crystals being capped by a secondary development of malachite, much larger in size and of different habit, these being doubly terminated, twinned, transparent, of a beautiful green color, and giving the appearance of being spiked on the primary slender crystals. Many other forms are frequently found. The most remarkable illustration of this occurrence is a specimen of heteromorphite from Felsobanya, Hungary, where some of the slender hair-like crystals have formed themselves into perfect rings of varying size and thickness, these being found scattered among the mass of straight hair-like crystals which cover the specimen.

One phase of micro collecting that makes it so attractive and interesting, is the possibility of eventually obtaining specimens, duplicates of which will not be found in another collection. This strongly tends to stimulate an interest in other collections, knowing some mounts will be seen that are unusually attractive, rare or very interesting. Frankly, I have found these is a spirit of generosity among micro collectors, that is virtually absent in hand specimen collectors, due probably to the fact there are usually many duplicates in micro specimens, but seldom in hand specimens, at least not of the same value or merit. Consequently the tendency to give or exchange duplicates with another person interested in this phase of mineralogy is general and stimulates a keener interest and enthusiasm. It also develops a tendency to be

more observant, lest interesting material be lost through careless breaking and selection of pieces, mounting, or failure to critically observe what is on a specimen. Comparison of collections or mounts is sure to create a spirit of friendly emulation and rivalry, competitive skill is gradually awakened and the collector is encouraged by successful finds, as well as by additions to his collection by exchange or purchase. This spirit stimulates one to greater care in preparing mounts and eventually improves the character of their specimens.

Source of Micro Material

The field or source of supply for the micro collector is unlimited. Mines and quarries in active operation are always a source of supply. Those that have been abandoned should never be overlooked or neglected, as frequently they will prove the source of valuable finds. The dumps irrespective of age or appearance, should always be carefully examined as they contain the majority of possible material after active work has ceased, and when patiently gone over will frequently yield magnificent specimens. The finest pyromorphite I have, with beautiful deep, green, transparent crystals, was obtained from a forgotten dump near the Old Wheatley Mine, that had lain untouched for over 50 years. The vug containing the crystals was filled with hardened mud and looked very unpromising, but, guided by past experience and following my motto, "always take a chance and accept nothing as definite until so proven", I washed it several times, gently removing the mud, until I began to see possibilities, finally obtaining several specimens I am very proud of, all of which would have been lost, had I followed my first impression and the inclination to discard the specimen as worthless. A few miles away are the old Ecton and Perkiomen Mines, among the first to be worked for copper in the United States some hundred or more years ago. From their dumps I have obtained handsome specimens of linarite, azurite, malachite, barite, cerussite, anglesite, calamine and other associated minerals equally interesting. Yet, collectors of hand specimens have repeatedly stated this and other similar localities are dead, which they are and have been for many years for hand specimens, but fortunately, not for micro. My experience, borne out by the opinion of others interested in micro collecting has been that the dumps of old, abandoned mines and quarries, which are accessible, are never dead until proven so by the micro mineralogist, and then only after repeated visits have definitely shown them to be so.

Obtaining Material

Very few dealers, other than Ward's Establishment, show or take any interest in obtaining and supplying micro material, but as more individuals become interested in the study of micro specimens, the increasing demand for good material will compel their interest and in a few more years excellent material for this purpose will undoubtedly be carried by them. As it is now, excellent material can be occasionally obtained from time to time and will well reward those interested, though many disappointments will occur. The next best source for obtaining material is from other collectors by the exchange or purchase of specimens. Every collector desires to add meritorious specimens to his collection and the exchanging of mounts by those interested gives him material unobtainable through dealers, adds to each collection and creates a spirit of unselfish sportsmanship, in being able to help someone at times, thereby holding, as well as increasing his interest and enthusiasm. The hoarding of material of interest to others is a selfish habit and benefits no one, whereas, its distribution is one of the best means to help others develop their collections, broaden this wonderful field of natural science and indirectly increase your own collection.

Care in Selection of Material

When collecting specimens for micro study, time should be taken to carefully examine all surfaces for coatings of minerals, especially looking for minute cracks, vugs or cavities, in which crystals might form. Accept all specimens as promising until proven otherwise, by careful breaking and subsequent observation. Your rewards will be frequent, many, and very often most surprising. It has been my custom to spend the greater part of my time on a collecting trip, to gathering promising material, carefully wrapped in newspapers for protection, and taking it home, there breaking it into small pieces for examination, under more suitable conditions than can

be found in the field. While I have met with poor luck many times, I have obtained better specimens by so doing, than others, who finding a suitable or promising specimen, spent their time in breaking it up at the site of finding, very frequently losing good material, by having pieces fly away when the mass specimen was broken, when this could have probably been saved, had it been broken at home under better conditions. Specimens should be broken into small pieces so that they will go into the box easily and not damage any small crystals that may be on the sides, also to determine whether there are minute cavities within the rock, unless by so doing, good material for mounting would be ruined. By following this method, I have obtained many very interesting and beautiful specimens that would have been overlooked, as the material did not show any indications of crystals, cracks or vugs on the surface. Do not throw away minute particles without careful examination, as they very frequently have excellent crystals on them. Big pieces do not always yield the finest crystals. Some of my finest and most beautiful crystals are on pieces of rock or gangue material no bigger than a celery seed. As it is impossible to see all of the area of a specimen through the microscope at one time, except with the lowest power objective, there is no special need of a big mount, unless the crystals are delicate or would be in danger of being lost, through further trimming to a smaller size. For field work I use a Globe Magnifier of 14x power, carrying it on a chain to avoid losing it. It permits good illumination and is of sufficient magnification to easily see small crystals. (See Plate No. 5—No. 15) I also use it for the preliminary examination of specimens, big or small, at home.

Grinding Surfaces

Many pieces of minerals are so irregular that they have to be ground down on one side or the bottom, to permit them being placed in the box, without damaging the crystals when the lid is placed in position. This is done when the rock is so shaped that the pinchers will not take a grip or the crystals so fragile, that further breaking, trimming or jarring, will cause them to fall off. For this purpose a carborundum wheel 6 to 9 inches in diameter by ½ to 1 inch in thickness, of 40 to 60 grit and running at a speed of 2000 to 5000 revolutions per minute, mounted vertically on a substantially grinder head, will be found a most necessary adjunct to preparing the specimens. It should be free from undue vibration for the best results, and to avoid unnecessary jarring. It should be used dry. It cuts quartz to a smooth surface quickly and with very little heating of the specimen. Other specimens may require the use of a slow turning, wet wheel, especially if there are very delicate crystals on the surface, that might be jarred off, if a high speed wheel was use. For this purpose a carborundum wheel 12 inches in diameter, one inch in thickness, of 40 to 60 grit, placed in a horizontal position, turning at about 300 revolutions per minute, and kept wet with water from a drip can, will be found very useful.

Cutting Material

Frequently material will be obtained where crystals are on the surface, resting on a large background of mass rock, which usually is very hard and often will cleave or break at acute angles to the crystallized surface, for reasons unknown. To attempt to break this type of a specimen with a hammer or by the use of a trimmer, will result in the loss of most of the crystals, if not all.

Prepare a vertical cutting wheel as follows. It is the type used by the lapidary to cut agate or other minerals. It should be made of thin gauge sheet tin, copper or brass, mounted on a grinder head, accurately centered, trued and free from lateral wobbling. The wheel may be 6 to 9 inches in diameter, the size being governed by the thickness of the material to be cut and the cutting speed desired. The cutting edge may be smooth or nicked by chattering with a knife, which process holds the grit. Carborundum of 50 to 150 mesh is used, depending on the hardness of the material to be cut. The cutting edge should be constantly supplied with a semi-liquid paste of grit and water. This method will slice off the crystallized surface at the desired thickness in a short time and without undue jarring. This slice can then be broken into small pieces. The specimen will have to be rigidly held in a clamp.

Trimming Tools

A trimmer is a very useful machine for breaking large rock specimens, especially where great pressure is needed. It is also satisfactory for dividing material into small pieces, and cracks them with very little jarring. (See plate No. 4). A heavy vise, fitted with triangular pieces of tough, hard steel, fastened to the face of each jaw, will answer the purpose of the trimmer, is much less expensive, does not take up as much room and can be fastened to a work-bench. A piece of hard iron plate six inches square by ½ inch thick, is very useful to break specimens on, when a hammer and chisels are used, if a trimmer or vise is not available. Various sized chisels will be found to come in very handy for certain types of work, especially when collecting in the field. Hand pliers are indispensable for dividing small pieces of minerals, as well as to break off the rough and uneven edges of specimens. Two types are very useful. One with a flat side known as a diagonal cutter, (see Plates No. 5, No. 16). This type is the most used and comes very handy for fine work. The other type known as an end cutter, is flattened on the ends. (See Plates No. 5, No. 17). It separates material easily and with little crushing and is a more powerful too than the side cutter. Both should be made of very hard steel. Kraeuter, of Trenton, N. J., makes them of excellent quality.

The Preparation and Selection of Mineral Specimens for Mounting

After the pieces of mineral are broken to a suitable size they should be carefully examined with a hand lens or magnifier, selecting the best, and these should again be examined under the microscope, picking out the choice specimens. By doing this, many fine mounts will be found, that would be overlooked if a hand magnifier was alone used. As both eyes are used with a binocular microscope, a depth of field is observed that is absent when a hand lens or magnifier is used, which enables many minute crystals to be seen, that would not otherwise be observed when one eye alone is used. By this method much time is saved and the final decision accurately made as to the merit of the specimen.

Cleaning Material

Rare indeed, is it to obtain a mineral specimen, as it is received from a dealer or as found, that is so clean and free from debris, that it does not need washing. The majority of specimens are dirty, many having the minute crystals hidden or covered by mud, dust or other debris, and in many instances material that is unpromising or unattractive when first examined, becomes a thing of beauty and interest after careful washing. Running water from a faucet will remove the majority of dirt or debris, but often it is necessary to use a soft-bristle brush, on which is placed a little liquid soap, water added and a thorough scrubbing given the specimen. I use a soft-bristle tooth brush for specimens where the crystals are well developed and firmly attached to the matrix and an artist's brush with moderately stiff bristles for those with delicate or very minute crystals. Provided I am careful, I seldom damage a specimen by this method of cleansing. A good lather is worked up and the space between the crystals is reached by gently pushing the soft bristles onto the surface of the crystalized area, finally rinsing with running water until all the lather is removed. This process is repeated until the crystals are bright, clean and the debris removed.

Scrubbing can not be used for crystals that are not firmly attached to the rock or on those of a hairy or fibrous character. Use running water only and of not too great a force. It is surprising

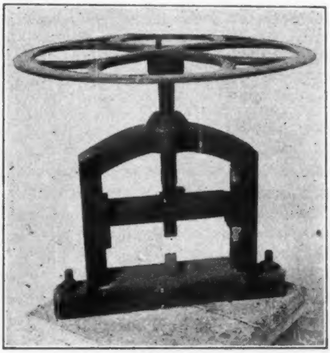


PLATE 4
Rock Trimmer

how very few crystals of a delicate structure will not stand washing in water. Minerals of a very fine fibrous or hairy character, like byssolite, asbestos, actinolite, cyanotrichite, chalcotrichite, mixite, serpeirite, jamesonite, some varieties of malachite, etc., can be safely cleansed only by blowing on them gently and steadily, rather than by sudden puffs, which will generally remove most of the dust or debris from these delicate specimens without harm. Water soluble minerals will have to be washed in 95% pure grain alcohol, which when available, can also be used to wash many minerals of a delicate hair-like character to advantage, as it will prevent the crystals from matting and sticking together. It will be found very difficult to restore to their original condition crystals of this character, that have been rinsed in water. Alcohol of the above strength, used after the final washing in water, materially shortens the drying period of specimens, but is not necessary, though very convenient at times. It is always advisable when in doubt, to take a piece of the specimen, wash it and note the results as to solubility, etc. A good rule to follow when preparing to mount specimens of an unknown mineral, is to consult Dana's Textbook of Mineralogy, where information as to solubility and other valuable data will be found.

To hasten the drying of specimens after washing, I use a rack made of brass wire screen of 1/8 inch mesh. The edges are turned over a 1/8 inch piece of brass wire to give rigidity, which is bent to a rectangular shape, 3 by 5 inches in size, and the brass wire screen soldered to it. The under surface of the screen is soldered to a ring of heavy gauge brass 3 inches in diameter by ¾ inch in height. This enables the rack to be placed on the top of the reflector on my desk lamp, taking advantage of the heat from the lamp, at the same time obtain ing illumination for my work. It is a convenient and compact arrangement and has proven indispensable in my work. The heat is not intense, but ample to quickly dry specimens, though not sufficient to damage them. All of my sulphur, as well as many other delicate specimens, were dried on this rack and show no effects from the continued heat. (Plate No. 5, No. 19).

Preparing the Cork Base for Mounts

Having selected the piece of mineral to be mounted, take a good cork free from large cracks or blemishes and cut; slice or dig out a groove or cavity that follows the contour of the bottom or base of the specimen, allowing it to fit snugly into it and keep it in the position you have selected as best suited to show the crystals when finally cemented to the cork and mounted in the box. In cutting cork, a very sharp, thin bladed knife is essential for quick, accurate and neat work. For this purpose select a knife with a blade about 4 inches long by ⅜ inch wide, tapering to a fine point and made of good steel which will retain a sharp, even edge. (see Plate No. 5, No. 1). For sharpening knives, an old razor strop fastened to a piece of wood the size of the strop, will give the necessary resistance, prevent it from slipping off of the strop and can be used for various sharpened knives or scalpels. A few drops of thin oil rubbed into the leather from time to time, will be found to prolong the life of the leather and also leave a very thin film on the knives, which will materially aid in cutting the cork, by lessening resistance. (see Plate No. 5, No. 12.) Other knives with short blades of various shapes and lengths are convenient. The surgeon's scalpel is the best, handiest and most serviceable for this purpose. With them the cork can be cut, picked out, a circular cut made, thin sections sliced or cut off neatly, as needed to make the specimen fit evenly, snugly and firmly. (see Plate No. 5, No. 2 and 3).

The bottom of the cork should now be cut or trimmed, keeping the specimen in the desired position. This is done to lower the mount so that the crystal surface of the specimen will not project above the rim of the box. If preferred, this can be done after the cork has been blackened and the specimen cemented to the cork and dried. In some instances this procedure is advisable, saving time and producing neater and more accurate results. To test whether the surface of the specimen has sufficient clearance to avoid damaging the crystals when the lid is put on the box, a long straight, stiff bristle will answer the purpose. The top of the crystals should have a clearance of not less than 1/32 inch below the rims of the lower section of the box. The

stiff bristle should be gently dragged along the rims of the box, touching both sides simultaneously. This will enable one to judge the amount of clearance the specimen has below the rims. Should the specimen be too high and the bristle touch its surface, no harm will be done the crystals, no matter how delicate.

Other Substances used for Mounting Bases

PLASTIC WOOD—This modern medium is being used by several collectors with satisfaction. It is supplied in cans. Sufficient of the plastic mass is taken and made into a cone, onto which the mineral is gently pressed into the desired position and put aside to set, which takes 24 hours or more. The dried mass can be trimmed into any shape desired, blackened, and then mounted.

PLASTER OF PARIS—Several collectors have used this method in the past, but it is seldom used today. It has the advantage of firmly holding the specimen in position and the smooth surface around the base of the specimen can be blackened, but the specimen is forever ruined where the plaster touches. To use—a semi-liquid paste is made of plaster of paris of very fine quality, such as dentists use, and sufficient poured into the bottom of the paper box or in a suitable mold of the same size as the box. The mineral is then gently pressed into the plastic mass and placed aside to set. After the plaster is dry, the top surface can be smoothed and blackened. It makes the boxes heavy.

CLAY—such as is used for modeling and of a composition that will dry hard and with little shrinking. Too much glycerine in the mixture will prevent it drying hard or quickly and also prevents the paint from adhering firmly. The best results are obtained when a cone of the clay is prepared suitable in diameter and height to the size of the specimen, which is firmly pressed into the top leaving a depression confirming to the shape of the bottom of the mineral. It is then put aside to dry, when it can be smoothed, leveled and blackened. When ready the base of the specimen is cemented into the depression, dried and mounted.

WAX—the type used by dentists is best suited for this purpose. It comes in thin sheets and can be obtained in black. It has proven satisfactory for mounting crystals or mineral fragments. Regarding permanency, it must be considered that wax is subject to softening when the temperature is above 80° F., which may change the position of the mineral after mounting. The cone should be prepared as for clay, but can not be painted satisfactorily.

Blackening the Cork

After the cork base has been cut to fit the specimen it should then be blackened to make a definite contrast between the mineral and the cork, as well as to make a neat, finished appearance. For this purpose a flat black lacquer or paint is the most serviceable, as it dries quickly, leaving a dull, non-reflecting surface and also makes the cork water and alcohol-proof. Water-proof India Ink is used by some collectors, but frequently some of the ink will run, when the cork is moistened during the final washing and flow down upon the specimen while it is being dried and spoil it. All points considered, the lacquer is the most dependable and satisfactory.

The blackening of the cork also sets the mineral specimen up in appearance and produces an unobtrusive background. A beautiful mineral specimen is worthy of a neat and artistic mounting, so prepared that when finally completed, the mineral stands up into prominence on the cork base and everything else fades into an inconspicuous background. Neatness of finished specimens should be more generally practiced, for the development of a painstaking, attractive, as well as artistic technique in mounting specimens, is to be encouraged, as it indicates a greater interest in attention to the minor details, so essential to the correct orientation of crystals. The use of dirty, poorly selected or prepared corks, unblackened or poorly blackened corks, too much cork showing around the base of the mineral, excess of cement present, slovenly technique, are evidence of a lack of interest in detail and are apt to leave an impression of indifference on the part of the collector and tend to create a doubt as to the correct identification of minerals mounted by him. The cork should be blackened wherever it may be seen, the cavity as well as the sides and top, but the bottom is not necessary, as the mucilage adheres better to unpainted surfaces. The drying screen (see Plate No. 5, No. 19), mentioned under wash-

ing mineral specimens, is also used to dry the painted corks on, as well as the specimens after cementing them to the corks.

Cements

Having prepared the cork base, the mineral should then be permanently fastened to it by means of a suitable cement. Regarding cements and adhesives in general as applied to mineralogy, the essential requirement is permanency, tenacity and elasticity. Of preference they should be insoluble in water and alcohol. They should set quickly and dry hard in a few hours. A very wide variety of suitable cements is to be found, but the ones mentioned have proven satisfactory by many years use. Frequently some of the cement inadvertently gets on to the crystalized surface of the specimen, usually the best portion of it, and unless it can be easily removed, mars the mount and sometimes ruins it, by covering the area that shows the best crystallization or point of interest. It is therefore to the collectors advantage and interest to select a cement that can be completely removed should it become necessary, regardless of age. For several years I have used DuPont's Household Cement, finding it superior to every other adhesive I have tried, having the desired properties and none of the disadvantages of the others.

DuPONT'S HOUSEHOLD CEMENT is transparent, nearly colorless, dries quickly at room temperature and adheres tenaciously to minerals, cork, wood or metal. Specimens can be washed, dried and mounted permanently a few hours after its application. When dry it is water-and alcohol-proof. It is easily and quickly applied to the cork, as it is put up in a collapsible tube with a small opening, which is kept closed by a small screweye when not in use, preventing evaporation. The desired amount can be readily applied, whether large or small, as needed, without waste or the balance in the tube drying out. Should it accidentally get on the crystal surface of a specimen when being mounted, or should it be desired to remount a specimen at a later period for some reason, it has the advantage of being readily and completely dissolved in DuPont's Duco Thinner, Amyl Acetate or Benzol. After the cement has been dissolved, the specimen should be washed 2 or 3 times in fresh solvent to remove all traces of the cement, then 95% pure grain alcohol should be used to remove all traces of the solvent or the crystals may be coated with a thin film of the undissolved cement.

GLUE is used by many collectors. As it is supplied in collapsible tubes, it can be more readily applied, than when taken from a bottle, but as it dries slowly, several hours must be allowed for it to thoroughly set. It is soluble in water and has the disadvantage of becoming hard and brittle with age and specimens occasionally drop off the cork. Frequently I have received specimens where glue was used, that were not mounted to suit me, were improperly orientated, or had the best crystal surface on the sides or bottom. To re-mount, it was first necessary to remove the old glue. For this purpose I use CAROID POWDER (made by the American Ferment Co. of Buffalo, N. Y.) 1 part, which is dissolved in 9 parts of boiling water and set aside to settle, after which the clear solution is either decanted or filtered. Its solvent or rather digestive action is more satisfactory if the solution is kept at a temperature of 90° F. while being used. This solution should be freshly made when needed, as it does not keep well. The specimen from which the glue is to be removed, is placed in this warm solution and left there until the glue is completely dissolved, which may take a few or several hours, depending upon the age, type, and amount of glue used. Gentle agitation will hasten solubility. When the glue is apparently dissolved, the specimen is thoroughly washed in running water and dried. It should then be examined under the microscope to see if all of the glue has been dissolved. If any glue remains, the process should be repeated until all has been removed. The specimen is then ready for mounting. If properly done, it is impossible to see whether the specimen has been previously mounted. The caroid is a powerful digestant of animal matter and I have never had it fail to completely remove all glue from a specimen regardless of the age or the type of glue used.

STRATENA CEMENT (Van Stan's), made by R. S. Pettet & Co., Philadelphia, Pa., is used by some collectors. It is colorless, transparent and has good adhesive qualities. It is necessary to heat it before applying it to specimens and

it is soluble in hot water. It is rather difficult and risky to remove or dissolve it, and possible damage by the heat, might be caused to some crystals by cracking, etc., if desired to re-mount the specimen at some time.

RED LEAD CEMENT is a composite adhesive used by the majority of older collectors and is still used by a few today. If properly made it is a good adhesive, but it has a tendency to get very hard and brittle with age, and specimens frequently drop off after being mounted many years. It is water-and alcohol-proof, but has the disadvantage of being impossible to remove once it has been applied. It is made as follows: Lead carbonate ½ ounce, Lead oxide red ½ ounce, Lead oxide yellow 1-½ ounces, all in a very fine powder. Thoroughly mix and place in a jar of about 12 ounces capacity. To this powder, add in small quantities Japanner's Gold Size, stirring thoroughly after each addition, until a glue-like consistency is obtained. Set aside for 24 hours. It will have become thickened during this period and more size is to be added until it is again of a glue-like consistency. Again set aside for 24 hours and repeat the previous procedure. This is to be done every day until it eventually does not have a tendency to become thickened to any extent during the 24 hour period. It is then ready for use, but improves with age, if kept covered tightly. As it increases in age, it may become necessary to gently heat it before applying to the specimen. Take the quantity on a metal probe with slightly flattened tip, warm gently and slowly over an alcohol burner, with a low flame, to prevent burning or ignition of the volatile vapors liberated by the heat, until softened. Then apply to the cork, place the specimen in position, press gently into the cement, and set aside to set, which generally takes about 24 hours.

SHELLAC—is a very satisfactory adhesive at times for certain purposes, especially when the mineral specimen is thin, of level surface on the back and it is not desired to have the adhesive spread up onto the crystal surface or on the edges of the specimen. It dries quickly, is insoluble in water and sparingly so in grain alcohol, but readily in wood alcohol, which is its solvent.

COLLODION—has been used by some collectors for mounting small crystals or fragments. The DuPont type of cement is more satisfactory.

JAPAN GOLD SIZE, DAMAR OR OTHER TRANSPARENT VARNISHES—may be used instead of shellac, as well as for mounting individual crystals and small fragments. Sufficient time should be allowed for the varnish to become tacky before setting the crystal on it, or it will spread up onto the sides and often mar the appearance.

Mounting the Specimen in the Paper Box

Having set the specimen in the cement it should be allowed to thoroughly dry, 24 hours will enable it to set so firmly, that any subsequent operation will not move it from the desired position. It should again be washed in running water to remove any dust or debris accumulating during its preparation or not thoroughly removed before mounting, then dried. The bottom of the cork should then be permanently fastened to the bottom of the paper box. For this purpose a mucilage is preferable as it holds tight, and should it be desired to remove the cork base at a later period, it can be readily done without much damage to the paper lining on the inside of the box. A satisfactory mucilage can be made as follows: take a pint bottle with a fair sized opening, add sufficient clear, clean pieces of Gum Arabic, not over ½ inch in size, until the bottle is half full, add 4 teaspoonfuls of white, granulated sugar, 10 drops of Oil of Clove, then fill the bottle to within ½ inch of the bottom of the neck with cider or white vinegar. Shake several times a day until all of the solids are dissolved. It is then ready for use, keeps indefinitely, mold does not form, it dries quickly and sticks very firmly.

Mounting Individual Crystals

Many instances will occur where minute, loose crystals will be broken or jarred off and be found among the fine fragments and dust remaining after breaking up a specimen, that will make attractive and interesting mounts, especially desirable if of a rare specie or when showing some unusual or abnormal faces or forms. The orientation of small crystals is a problem and difficult at times, but these can be mounted, with few exceptions, and added to the collection, provided the necessary patience and

time is given to their mounting and the disappointments resulting from the first failures do not discourage further attempts to perfect the technique necessary to success. Many a good crystal has been discarded because of improper mounting or orientation. These can be re-mounted time and again until the desired position is obtained, provided the correct solvent for the cement to be removed is used, which may take some time and experiment to determine, if unknown. In general all acid solvents should be avoided, as they leave some evidence of their use in the majority of cases. Anything worth while requires patience, but the reward of accomplishing something difficult by overcoming the many setbacks that arise, has a compensation that repays one many times over, for sticking to what they start, until they get it.

The following method will be found satisfactory for mounting individual crystals. Make a round circle of medium heavy paper about ¼ inch in diameter. If the crystal is white, transparent or of a faint color, the paper should be blackened with Higgin's Water-Proof India Ink, or for dark colored crystals, white paper should be selected, as a contrasting background. Celluloid can now be obtained in thin opaque sheets, of dull surface, black or white, which has proven very satisfactory in place of the paper and has the advantage of being water- and alcohol-proof and needs no additional preparation.

Paper punches can be used to make the little circles and are accurate, economical, and permit rapid preparation. Take one of the circles and pierce the center with a very fine needle, making a neat, smooth hole. The circle, if of paper, should now be blackened and dried. Select a cork, cut the top and bottom parallel, and to the proper height to fit the box, allowing clearance. Slope the sides so that the top will be less in area than the circle, blacken and dry. The hole should be of such a diameter, that the crystal will just be held in the desired position and not sink into it but slightly, preventing the adhesive from getting too high up the sides and spoiling the appearance. If the crystal is large enough to be easily and quickly handled in placing into position, the hole in the circle should not exceed ¼ the size of the diameter of the crystal, DuPont's Cement can be used, taking advantage of its quick drying properties. Should the crystal be very small and require great care in setting into position, damar varnish or white shellac should be used, as they do not dry so quickly and will give one more time for orientation. Spread a thin coat of the selected adhesive on the top of the cork and place the pierced circle over it. Press down gently, but firmly, until a small drop of the adhesive comes up through the hole. Place the crystal in the desired position on this minute drop and set aside to dry, for at least 24 hours.

Some crystals on account of their shape are difficult to place in the desired position accurately and quickly. It will be found easier to orientate them under the microscope, using a flat piece of cork with a shallow groove cut into it, which will keep the crystal in the selected position without difficulty. Having placed the crystal in the proper position, reverse it and then place the prepared circle with the adhesive protruding through the hole, over it. The crystal will adhere to the adhesive and the cork may then be placed on its base and set aside to dry.

Occasionally it will be found quite difficult to keep the crystal in the desired position until the adhesive has dried. A method that will help to overcome this difficulty is as follows: Take a piece of cork with an even surface, dig out a minute hole sufficient in depth and diameter to permit the crystal to be placed in it, base up, without falling on its side. Having made the hole to suit the shape of the crystal, remove it and place a minute amount of mucilage in the cavity in the cork, replace the crystal in the hole, being careful that none of the mucilage gets on the base or runs up the sides, and set aside until the mucilage is dry. Then take a circle, previously prepared with cork base, with the adhesive which should be insoluble in water, protruding through the hole and place over the base of the embedded crystal, holding it in position by means of a rubber band or light clamp and allow it to dry. The corks are then placed in warm water to dissolve the mucilage. When the corks separate, the one holding the crystal on the circle, is removed and gently washed to remove all traces of the mucilage from the surface of the crystal that was held in the hole and dried. The crystal will then be found to be in the desired position and can be permanently mounted in the box.

There may be times when the use of the pierced circle will not be suitable and a different type of base be necessary. Take a thin, round piece of wood, such as a toothpick, cut to the required height after mounting in a piece of cork, smoothing the projecting tip to a point of sufficient area to mount the crystal, making a depression in the center, of sufficient diameter to set the crystal into, blacken and dry. Set the crystal into the position desired, using a method previously described. Cork, trimmed to a fine point, also serves the purpose well, depending upon the size and character of the crystal to be mounted.

Where there are several crystals to be mounted, a different procedure is required. Take a piece of opaque, white or black glass, 1/8 inch thick, which can be obtained from a glazier, cut into small pieces 1/2 by 3/4 inch, which will be found a satisfactory size, or any other as desired, and grind down the edges and both surfaces. (See Paragraph—TO GRIND A DULL SURFACE ON POLISHED GLASS). A thin smear of damar varnish or white shellac may now be applied, using a fine hair brush, or by a method used by physicians to spread a blood smear, as follows—take a glass slide with sharp edges, such as is used for mounting microscopic objects and cut one end to the desired width of the smear of adhesive. Place a small drop of the adhesive on one end of the ground glass piece, but not too near the edge, place the glass slide on the glass, touching the drop, so that it will spread between the end and the surface of the glass, holding the slide at an angle of about 45 degrees to the ground glass piece and quickly draw the slide across the surface of the piece. This will leave a very even, thin film of the adhesive upon the ground glass surface. A little practice may be required to spread the film evenly, but once acquired, this method will be found very satisfactory. Place the crystals in the desired position and put aside to dry for several hours. Crystals so mounted, can be washed without any danger of their being lost. This type of mount makes the crystals show up well in contrast on the dull, opaque background, producing a neat, attractive and pleasing appearance.

To Grind a Dull Surface on Polished Glass

Take a piece of polished glass, 1/2 inch by 3/4 inch or larger or smaller as desired. Obtain a piece of plate glass not less than 1/4 inch thick and 6 inches square or larger. On this plate place a small amount of carborundum grit, the mesh depending upon whether the surface of the glass to be ground is rough or smooth. If rough it is better to start with FF size. Add a little water to the grit on the plate, place the glass piece on this moistened grit and with a circular motion rub the glass piece over the plate, adding water from time to time to prevent the glass from sticking, also more grit if needed, until a dull, even surface is obtained. Wash this piece of glass thoroughly in running water to remove every trace of the grit, for should any of it get on the plate when subsequently using a finer mesh grit, it will scratch the ground surface and necessitate re-grinding with the coarser grit to again produce an even surface, before proceeding with the finer grit. It is advisable to have several thick glass plates for each size grit used. It saves time, and tends to prevent getting the different grits mixed.

The glass piece being thoroughly washed of the coarser grit, take a small amount of 60 minute water floated carborundum powder and again rub the glass piece until a smooth surface is again uniformly obtained. Wash again, and if a still smoother surface is desired, use optical finishing emery, which may be obtained from any optician, following the same method as described above. The edges of the glass piece may be ground down if desired. This process produces an even, flat, smooth, dull surface, that will not reflect light and enables the adhesive to obtain a firmer hold on the glass, than when polished. It is advisable to have several of the glass pieces prepared and ready for use when desired, as their preparation takes considerable time.

Another method that can be used when the opaque glass is unobtainable, is to use ordinary window glass, grinding one or both surfaces to the desired smoothness. One face can be painted with several coats of either white or black enamel, permitting sufficient time to elapse between each coat for the enamel to dry hard. This procedure produces satisfac-

tory results, but is not so easy in preparation. The painted surface is fastened to the cork by cement.

Acid Solvents for Calcite

Specimens are frequently obtained where the crystals are covered by a deposit of calcite, and sometimes the crystals are enclosed within it. Often it is desired to obtain these crystals for mounting individually, or to remove the calcite deposit, thereby exposing the crystal surface, so that good mounts may be obtained. When calcite encloses or covers minerals not acted on by hydrochloric acid, a 10 per cent solution of this acid will be generally found to be sufficient to remove it completely. Thorough washing in running water should be given the specimen afterwards to remove all traces of the acid. When a mineral is of such a character as to be acted on by this acid, a 10 per cent solution of citric acid, will remove the calcite without acting on the mineral. The chemical action is slow and should be carefully watched, as insoluble calcium citrate may be deposited. Frequent washing in water, in addition to changing to fresh solution, will prevent its accumulation. Once it is formed, it is quite difficult to remove. A 10 per cent solution of acetic acid will sometimes remove part or all of this deposit.

To Remove Iron Stains

A solution of tartaric acid of 10 percent strength, will usually be found effective in removing the yellow iron stain or deposit, frequently found on minerals. This is very often seen on quarts specimens. Thorough washing in running water after using the acid solution should be given the specimen.

In all instances, previous to using any acid solution, reference to Dana should be made, as the action of all acids is given under each title. By so doing the loss of specimens will be avoided.

Paper Boxes

Two types of paper boxes are used by microscopic collectors as follows. THE OBLONG BOX—measures on the outside, 1-1/16 inch long by 13/16 inch wide by 5/8 inch high. The lid which should fit snugly without undue friction, measures on the outside, 1-3/32 inch long by 29/32 inch wide by 10/32 inch high. The cardboard used is approximately 1/64 inch thick.

THE SQUARE BOX—measures on the outside 15/16 by 15/16 inch wide by 11/16 inch high. The lid measures on the outside 1 by 1 inch wide by 11/64 inch high.

The bottom section of either type is covered inside and out with a dull surface black paper, and a white label pasted on the bottom for records. The lids are covered with a white glazed paper on the outside only and are banded by red or blue paper. The inside is seldom covered. A white label of unglazed paper is pasted on the top of the lid for records.

The oblong box is preferable, as it gives but two positions for orientation, instead of four with the square box, and permits the use of larger specimens. Odd as it may seem, mineral pieces are more frequently rectangular than square, and thin rather than thick, though they may vary in all dimensions. From experience the oblong box is preferred by many collectors.

Labeling

After mounting the specimen in the box, labeling is the next important step. On the label should be placed the name of the mineral, the locality from which it was obtained and a number for ready reference. Special marking, as a dot in one corner or a line under the name, in red ink, can be used to call attention to some unique, interesting, or unusual feature of the specimen, and also enables a particular mount to be selected from the others without having to remove the lid to see what special merit it has. This manner of marking will come in very handy after the collection has passed the hundred mark, for there will always be many interesting and unusually beautiful, as well as odd specimens in a collection, and some definite system of marking them in such a manner as to indicate their points of interest, should be adopted in the beginning. Similar information should be placed on the label on the bottom of the box. A label pasted on the inside of the lid on which is placed the system to which the mineral belongs, the chemical formula and composition, reference to the page in Dana's Textbook of Mineralogy, where information regarding it may be found, the date and from what source obtained, will be found very convenient for quick reference. The alphabetical arrangement of a micro col-

lection is preferable, as specimens can be easily and quickly located. Dana's system of classification may be satisfactory for a large hand collection, but it is very confusing in a micro collection, as many minerals will not be represented in it, as they never occur crystallized and mass specimens are of little interest microscopically.

Instruments for Mounting Specimens

The instruments used for preparing corks and mounting specimens can be as few or many, and of as varied a character, as the individual collector desires. The following instruments and tools have proven to be essential and enable the work to be quickly and neatly done. These are illustrated on Plate No. 5.

1—A thin bladed knife of good steel, 4 inches long by ¾ inch wide, for slicing, cutting, or trimming corks.

2—A surgeon's scalpel, thin, tapering blade, ½ inch long by ⅛ inch wide, for cutting small cavities or making cuts in the corks.

3—A surgeon's scalpel, medium thin blade, 1-¼ inch long by ¼inch wide, for heavier cutting than No. 2. Various other sizes may be added, to suit individual requirements.

4—1 pair forceps 6 inches long, tips ⅛ inch wide, serrated on the inside for picking up or holding specimens.

5—1 pair forceps, same as No. 4, the inside of the tips ground smooth for removing the corks from No. 8, after blackening. The paint should be wiped from the tips after handling blackened cork, to prevent the accumulation of paint, which would cause the next cork to adhere to them.

6—1 pair small forceps 4 inches long or more in some patterns, with curved tips.

7—1 pair small forceps 4 inches long, with straight tips. There are times when the straight tips will be handier than the curved.

8—A shoe-buttoner or other appliance of similar type with flat handle, the tip cut off or straightened, and sharpened to a fine point, for sticking the corks on while being blackened. A long hat-pin will do, but is not so easily handled, owing in the absence of the flat handle to grip.

PLATE 5
Mounting Cabinet.

9—Dentist's probe with magnifier. This is a very useful and handy instrument for removing fragments of crystals from their attachment, prying away edges of cavities, or light excavating work. It is made as follows. Take a dentist's probe with a fine curved or straight tip. One with detachable tips is better. Take a cork about ½ inch in diameter and length. Cut a hole through the center slightly smaller than the thickness of the probe. Push the probe through the hole until 1-½ inches from the end of the tip. Fasten a small magnifier to a piece of strong wire. The other end is wrapped around the cork about the middle of it. Sufficient distance must be left between the lens and the attachment of the wire on the cork, to permit a clear focus on the point of the tip. When used, the specimen can be held in one hand or on a firm support and the probe in the other hand. Wherever the tip of the probe is placed, that area will be seen and clearly magnified several times. The broken crystal or edges of a cavity can be accurately and quickly removed.

10—Dentist's probe without magnifying lens.

11—Needle-holder for holding various sized needles for very fine work. Used as No. 10.

12. A razor strop fastened to a board for sharpening knives.

13. Pieces of cork for holding specimens in position while being prepared.

14. Glass alcohol lamps from which the wicks have been removed. One contains mucilage, the other flat black lacquer. The air-tight caps prevent evaporation. In the cap a pierced cork is tightly placed. A camel's hair brush may be placed in the hole and will prove handy for applying the lacquer or mucilage, as it will not dry out.

15—Pocket magnifiers of different types.

16—Diagonal cutter.

17—End cutter.

18—A rack made of several pieces of cork, prepared as No. 13, placed end to end and fastened in a long cardboard lid. Used to hold pieces of minerals while being prepared.

19—Drying rack, utilizing the heat from the electric light reflector.

20. Mounting cabinet.

A very fine grit carborundum razor hone (not illustrated) for sharpening knives, when they get dull and will not take a good cutting edge on the strop.

Other instruments and accessories can be added to suit individual needs.

Storing the Collection

The storing of a micro collection is simple and takes little space. Cardboard boxes with substantial lids, which will keep out light and dust, serve a very useful purpose in housing a collection, until it reaches such a size as to require drawers. Cases can be obtained in sectional form of wood or metal, with shallow drawers of various heights, that are neat, compact and occupy little space. The boxes or drawers should be numbered and labeled alphabetically for ready reference. Micro material keeps indefinitely in the boxes or drawers, as it is protected from dust, light, sudden changes of heat or cold, or atmospheric variations. Should a specimen in the box get dusty from being frequently opened, gentle blowing on it will usually remove the dust, though occasionally it may require washing. Place the box without removing the specimen, under the tap and wash in running water until clean, then dehydrate with 95 per cent pure grain alcohol and place upside down over gentle heat until dry. Apparently this procedure does not damage the box, provided it is substantially made.

Another cabinet which is very convenient, contains drawers not less than 2 inches deep, the length and breadth being made to suit the individual. In it mineral specimens can be stored until mounted. At times mineral specimens accumulate more rapidly than can be prepared and a place to keep them where they will not be lost or damaged will prove very serviceable.

Care in Handling Specimens or Material

Micro specimens and unmounted material should always be very gently and carefully handled. The crystallized surfaces or areas should not be touched with the fingers, as the minute crystals are very easily broken and minute, delicate, fibre-like crystals of cyanotrichite, chalcotrichite, cacoxenite, jamesonite, actinolite, asbestos and many others, may be pressed into a tangled mat, that can never be restored to the original condition and appearance. The surface crystallizations of many specimens are ruined by thoughtless, careless, or rough handling before they reach the collector. Fortunately however, in many instances speci-

mens so damaged can be broken into small pieces, and excellent mounts obtained from the fresh surfaces exposed. Any specimen showing minute crystals or hair-like surfaces, should never have cotton placed next to them. The cotton fibres become entangled in the crystals and are very difficult to remove without damaging them. Specimens should always be wrapped with soft tissue paper next to the surface, then cotton or wadding may be placed around this for additional protection, finally wrapping it in heavy paper.

Those examining a collection, who are unfamiliar with micro specimens and their extreme fragility, should always be warned before opening a box, to look all they want to, but under no circumstances touch the specimen. By taking this precaution, many a specimen will be saved from danger or utter ruin.

The Microscope

The single tube or monocular type microscope is better than none, but its field is flat, has no depth, and the perspective effect is absent. The ideal type is the binocular or two eyepiece microscope, two being used, the Wenham and the Greenough.

The Wenham Binocular Microscope

The Wenham type of binocular microscope was devised in 1860 by the gentleman whom it is named after and has proven exceptionally satisfactory. It is the type used by the great majority of older mineralogists and is still used by many of the younger collectors. It was made by the majority of the older manufacturers,—Beck, Ross, Zentmayer,—but today is made only by Watson of England. Two oculars or eyepieces and one objective are used, the transmitted light from the objective or magnifying lens, being divided into two beams by means of a prism, one going direct to the right eye, the other being deflected by the prism to the left eye. It gives excellent results, even with comparatively high power objectives, good illumination and very satisfactory stereoscopic effects. The field is reversed and the tube being quite long, it makes the instrument stand much higher than the modern microscope. A multiple nosepiece may be attached and two or three objectives of increasing power used. A side reflector may be slipped on each objective. The Wenham type of microscope has this disadvantage however, that should the prism become dirty and become thrown out of alignment when cleaned, it often takes a long time and much patience to again place it in the correct position. Very few if any, are being made today and in a few more years this type of microscope will disappear from the market and only be found in museums. (see Plate No. 6).

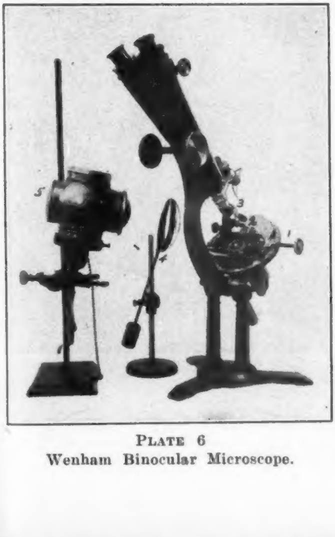


PLATE 6
Wenham Binocular Microscope.

The Greenough Type Binocular Microscope

This is the newest and most satisfactory type of microscope for the examination of opaque objects and is rapidly replacing the Wenham type for many reasons. It has two objectives and two oculars, combining in reality two microscopes connected together. The objectives focus to a given point at an angle of 16 degrees. The tubes are shorter and by means of the Porro type of prisms the focal length is made about the same as the older long tube type. The figure is not reversed, but is upright and in the normal position. The ideal stereoscopic effect is obtained. Better illumination is possible and the depth of field is greater. It is the most satisfactory type of microscope to use. (see Plate No. 7).

Care should be exercised in the selection of a new Greenough type microscope, not only from the standpoint of obtaining excellent lens systems, but in

addition, other attachments and accessories, that will prove of assistance, increase comfort in the examination of micro mounts, and permit prolonged periods of observation without ocular fatigue. The angle of 16 degrees for the lens system of this type of microscope adopted by the manufacturers, will cause little or no discomfort to those, who, fortunately do not need glasses or require but a low correction to give normal vision. To those who have passed their forties or need strong lens to correct their vision, the tendency to fatigue of the muscles of the eye when using the microscope for any length of time, is noticeable in many individuals, preventing them from the full enjoyment in the study of the minute forms found in nature.

The Spencer Lens Co. of Buffalo, N. Y., make a Greenough type microscope with several innovations. The 16 degree angle is used for the objectives only, the angle between the oculars being decreased to 8 degrees, by means of prisms. This change in visual angle is a great improvement and permits the use of the microscope for long periods without fatigue.

Three manufacturers now make attachments for the rapid changing of objectives, varying quite considerable in design. That made by the Bausch and Lomb Company, is of a rotating cylinder type, with all lens fixed permanently and not changeable. That made by the firm of E. Leitz is a sliding plate, with one set of lenses of very low magnification, permanently mounted, the other two interchangeable. The revolving, changeable nosepiece made by the Spencer Lens Co. is in my opinion, the most satisfactory, practical and convenient type. It permits the selection of objectives of a very wide range of magnification, any set of which may be quickly removed, another slipped in and firmly locked into position. Three sets of objectives can be carried on the nosepiece at one time, so that a set of low, medium and high power, selected by the observer as best for his purpose, are at his command instantly.

Extreme high magnification can not be satisfactorily obtained as there is not

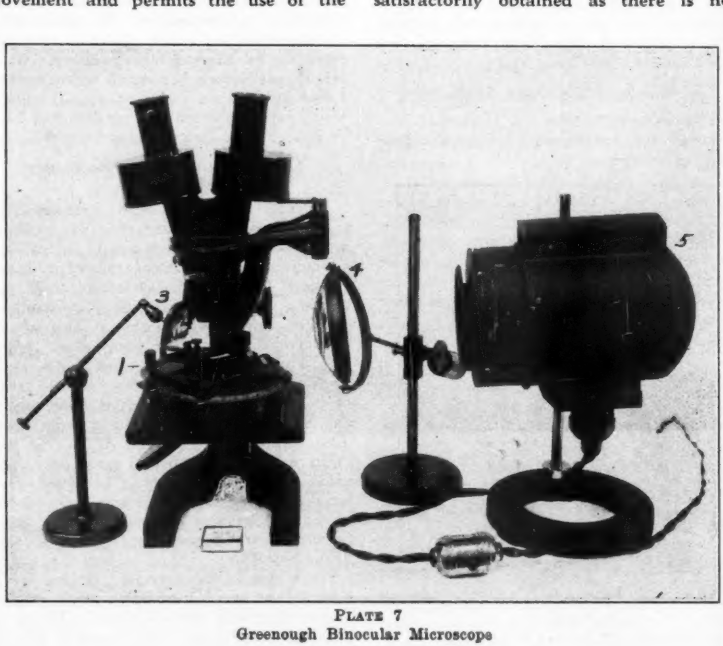


PLATE 7
Greenough Binocular Microscope

sufficient distance between the lens and the object to be magnified, to permit enough light on the specimen to see distinctly. The depth of sharp focusing is so shallow, that only a very minute portion of a crystal will be in focus, the rest of it being blurred. If the highest magnification practical to obtain is desired, it is better to use an objective that enables the crystal to be sharply in focus, then use high power oculars to increase the image. The use of high power oculars may decrease the brilliancy of the image, but will enlarge it without distortion or loss of sharpness.

For general use a medium low magnification will be found more satisfactory. An objective of 1½ inch or 40 mm in combination with eyepieces of 2 inches or 5x power, will give a magnification of approximately 18 times. I have found a combination of 1-½, 1, and ¾ inch objectives with 2 inch oculars, occasionally using 1-½ inch oculars, to be the most satisfactory for general use.

There are rare instances where the crystals are extremely minute and on a flat surface, where a high power lens, ½ inch, may give satisfactory results, but always with a corresponding loss of light, and depth of focus.

Mechanical Stage and Accessories

Very few microscopes are equipped with a mechanical stage, giving horizontal, vertical and rotary movements. An attachment of this type will be found to be of great assistance in bringing the area to be examined into the field of the microscope quickly, accurately and without vibration. A stage giving these movements can be obtained from the manufacturer, and fitted into a stage by a skillful mechanic. Provision should be made to enable the stage to be correctly centered, otherwise the point under magnification will be moved out of the visual field, when it is rotated. (see Plate No. 6, No. 1,—No. 7, No. 1).

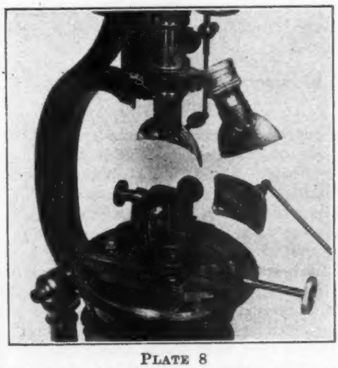


PLATE 8
Rotating Mechanical Stage with Box Orientating Attachment, also showing 3 types of side reflectors.

Box Orientating Attachment

This is a metal attachment which can be used on the rotating mechanical stage of a microscope or any other type of mechanical stage. It participates in all the motions of the stage, as well as those peculiar to itself, i. e.: up and down movements at right angles to, and independent of each other. By its use the observer is able to see any crystal on the top or sides of a specimen, and it can be orientated in any direction necessary to bring the various faces into the best position for examination. (see Plate No. 6, No. 2—Plate No. 8, No. 2).

Illumination of Mounts

A micro specimen being considered opaque, regardless of whether the crystals are transparent or not, requires that the light for its illumination be directed or reflected down upon its surface. The rays are reflected from the surface of the mineral through the lens system of the microscope to the observer's eyes, instead of being transmitted through the object, as prepared on the usual microscopic slide. Adequate illumination is absolutely essential for the proper and satisfactory examination of the micro specimen. More light, is therefore required, for an opaque mount, than when examining a microscopic slide, through which the light passes. To accomplish this purpose several methods are practical and serviceable. The use of a side reflector, often termed a parabolic reflector, made of silver and highly polished, which reflects the light obliquely in a concentrated area on the specimen, the light source being placed in front of, or to one side of the microscope, will be found to give very uniform and satisfactory results and is the type more generally used with a single objective. The reflector is usually attached, by means of a spring clip, to the objective, or by means of an adapter placed between the

microscope tube and the objective, and by means of a swivel, or ball and socket joints, the reflector can be placed and held in any desired position. As the reflector moves up and down with the microscope body, the light source is constantly kept focused on the object without variation. To use a side reflector on a Greenough microscope, a rectangular type is preferable. This may be mounted on an adjustable stand or fastened to the stage or body of the microscope. This reflector is more satisfactory than direct oblique illumination, as the shadows are more diffused, shorter in length and a better contrast obtained. (see Plates No. 6, 7 and 8, No. 3).

Another method is to place the light to one side and above the stage of the microscope, using a bulls-eye condenser of 9 to 12 diopters, which concentrates the light on a small area on the specimen. If the bulb is not frosted, a piece of ground glass should be placed between the light and bulls-eye, which produces an even distribution of light. (see Plates No. 6 and 7, No. 4).

Other methods, of a very wide character can be used to obtain satisfactory illumination of the specimen, indeed, the individual preference as to a satisfactory result is unlimited and in some cases, very ingenious. One point however, is to be noted, that the best results will be obtained when the light is thrown onto one side of the specimen only. This produces contrasts and shadows, which if eliminated, will frequently cause the crystals to become quite inconspicuous and difficult to observe. A Madza lamp of 50 to 100 watts, with frosted globe, will be found to give ample illumination for the usual examination.

Several manufacturers of microscopes and accessories, make different types of lamps, many of which are very well adapted for illuminating micro specimens, being small, light in weight, compact and give an intense, even source of light. (see Plates No. 6 and 7, No. 5).

Mounting Cabinet

An accessory of much value is a box or cabinet, with a removable or hinged lid. It should contain a shelf for holding knives, small instruments, cement, bottles of black paint and mucilage, solvents, varnish, shellac, toothpicks (for applying minute amounts of cement to the corks or removing any excess), and empty boxes. Underneath the shelf are several bins for holding corks, which should be of various sizes for handiness, economy and saving of time. On the sides are several hooks to hold the forceps. On the bottom is fastened a black of soft wood, 5 inches on the back, 2-¾ inches on the front, 2½ inches wide, and ½ inch thick. This is used to trim the corks on during their preparation for the mounts. It will also be found convenient to have several pieces of cork, 2 inches long by 1-½ inches wide by ½ to ¾ inch thick. In each is cut a groove the long way about ⅜ inch in depth, sloping to within ⅛ inch of the edges. Two notches are cut in each side. On the other side a shallow groove may be cut. They are handy to hold specimens during the preliminary examination, as well as to keep them in the desired position until the final mounting. They are readily placed on the microscope stage, if of the proper size, and the piece of mineral can be turned or moved about, until the desired position is obtained, and it can be left undisturbed until mounted. They can be lifted about without disturbing the position of the specimens. (see Plate No. 5, No. 13).

Another method for the preliminary examination of small pieces of mineral specimens is as follows. Take the bottome of a box. Make a false bottom, that will come up to within ¼ inch of the rims. Securely fasten it to the bottom or sides with a suitable adhesive. It will be found to hold specimens in the desired position in a very satisfactory manner, especially when the microscope is tilted.

Revolving Table for Microscopic Examination

For convenience, when several persons desire to examine specimens through a microscope, a revolving table is indispensable. The top should not be over 28 inches from the floor and should have sufficient clearance under the edge to permit the knees being comfortably placed without touching the top, and jarring the microscope when in use, or when the top is turned from one observer to the other. In use, the microscope is tilted to an angle that suits those about the table, the microscope is focused on the specimen and the table can then be turned to each person in rotation, who can view

the speciment under the ideal condition of illumination, comfort and pleasure.

* * *

During the early stages of my collecting and mounting, my enthusiasm was consistently encouraged by the patient interest of many friendly mineralogists, who, while not taking much interest in micro specimens, kindly aided me by supplying material, which had little or no interest to them, from their collections and helped me identify my specimens. They, as well as many other ardent and enthusiastic micro mineralogists, gave freely of the material they had, as well as their time and offered their advice, suggestions, help and encouragement, at a time when it was most needed and appreciated. To them, I offer my sincere thanks, in grateful acknowledgment of their unfailing patience, kindness and generosity, and it has been my pleasure many times to extend this spirit to others, who have shown a definite interest in micro mineralogy. By so doing, the pleasures I have enjoyed have been in turn spread to others and have brought to them a similar enjoyment and enthusiasm.

To those who so kindly helped me in gathering material for this article, I am deeply indebted, for without the information they so generously gave to me, I could not have made it as complete as it is now presented. If it will be of help to those interested in this beautiful and fascinating study of minerals, my efforts will not have been futile, but well rewarded.

Our appeal in the last issue for notes on molybdenite occurrences was very successful as many readers submitted such notes and donated samples of the mineral too. Our grateful thanks are extended to these kind friends.

A subscriber, who frequently spends his summer vacations at Rockport, Mass., writes, "I have always found the local science teachers extremely courteous and helpful in assisting visiting collectors to find localities for profitable "hunting." They have saved me an enormous lot of time and effort."

The science teachers referred to are connected with the Gloucester (Mass.) High School.

"In order to pursue, with pleasure and advantage, the studies of Mineralogy and Geology, some previous knowledge of Natural Philosophy and Conchology is important; but an acquaintance with the general principles and **nomenclature** of **chemistry** is indispensable."—Parker Cleaveland, **Elementary Treatise on Mineralogy and Geology,** 2nd. Edition, Preface, 1822.

A new find of colored tourmaline, pollucite and associated minerals is reported in the Town of Paris, Maine, a short distance west of Snow Falls, on the Little Androscoggin River.

William C. McKinley, a young collector of 16, who claims Peoria, Ill., as his home town, had a very interesting article —"Our American Gems"—in the October 19th issue of **The Peoria Star.** See ROCKS AND MINERALS, March 1931, Vol. 6, No. 1, p. 34).

The Gem Shop, who for many years were located in Wolf Creek, Montana, have moved to larger and more spacious quarters in the capitol city where they are rapidly re-arranging their wide stock in order to better serve their very large number of satisfied customers and friends. Our sincere good wishes are extended The Gem Shop and may their large circle of warm friends throughout the world join us in extending congratulations.

The new address of The Gem Shop is 15A Kohrs Block, Helena, Montana.

The largest number of votes received to date total 100 and were sent us by St. Mary's School of New England, N. D. From Kenneth Renoll of Hanover, Penna., we received 24 votes; from C. C. Pines, of Philadelphia, Penn., 19; from Voorhis School for Boys, San Dimas, Calif., 15; and from E. H. Cienkowski of Philadelphia, Penn., and from the Maine Mineralogical and Geological Society, Portland, Me., 14 votes each.

The Significance of Van Hise Rock

—By—

FREDERICK SHEPHERD

Division of Geology and Mineral Industries, Museum of Science and Industry, Chicago, Ill.

(Photographs and Sketches by the Author)

Van Hise Rock, a small erosional remnant of Baraboo quartzite, stands isolated from an adjacent cliff in the Upper Narrows of Baraboo river, near Ableman, Wisconsin. The rock stands in the classical Baraboo district where it has attracted the interest of literally hundreds of geologists. The bedding in this rock is vertical. One of the rock's two massive beds displays numerous joints; the other, an incompetent stratum, reveals many curved lines of fracture. All of these structural features bear mute testimony of the enormous pressure once applied in this area to form the Baraboo ranges.

FIG. 1
VAN HISE ROCK

It is very fitting that this rock be named after Dr. Van Hise, whose name recalls to mind his great contribution toward and partial responsibility for another region nearby which is classical as a field of study for pre-Cambrian geology—the Lake Superior region. In the memorial paper written by Dr. C. K. Leith, it is clearly pointed out that Dr. Van Hise bent most of his efforts toward the welding of minute details into well-defined, broad, scientific principles—much of which work was carried on in these districts.

In 1923 friends of Van Hise at the University of Wisconsin erected a tablet on this rock. It reads:

"Van Hise Rock"

"The material of this rock was once sand on the sea bottom and has since hardened into quartzite. It was tilted to the present position by a slow earth movement, and then separated from the adjacent cliff by erosion. The vertical light and dark bands represent the original layers. The inclined cracks in the dark layer were caused by the readjustment in the layers during the tilting.

"This rock is pictured in geologic books as a type illustrating important principles of structural geology, and has been a point of special interest to many investigators in geology visiting this region.

"President Charles R. Van Hise of the University of Wisconsin was one of the first and foremost of these."

Because this particular rock has played such an important part in the interpretation of the major structural features of the Baraboo district, let us review some of the secondary structural phenomena which have made this possible.

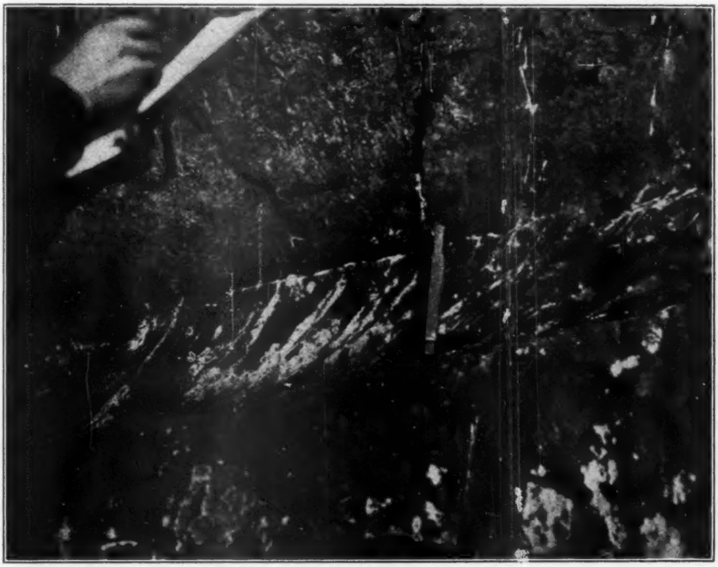


Fig. 2
Incompetent Schistose Bed. It lies between two massive quartzite layers and is exposed on the East bluff at Devil's Lake.

Let us first observe similar features found on the South range. (See Fig. 2.) The photograph shows an outcrop on the East bluff at Devil's Lake where an incompetent layer has been made schistose while the adjacent massive beds have given rise to joints due to the folding of the ridges. The bedding joints, strike joints and fracture cleavages are the significant features that indicate the direction and nature of the major movement, knowing, of course, the strike and dip of the beds. As is shown in Figure 3, this outcrop is on the south limb of a syncline.

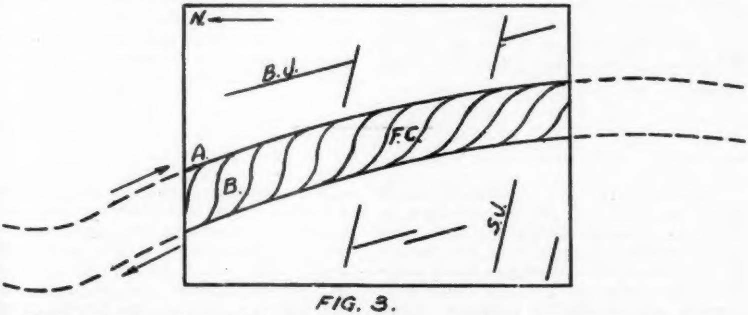


FIG. 3.
Sketch showing the Relations between the Secondary Structures and the Major Structure of the Region. The arrows indicate the relative movement of the beds. (A—massive quartzite; B—schistose bed; BJ—bedding joints; SJ—strike joints; FC—fracture cleavage.)

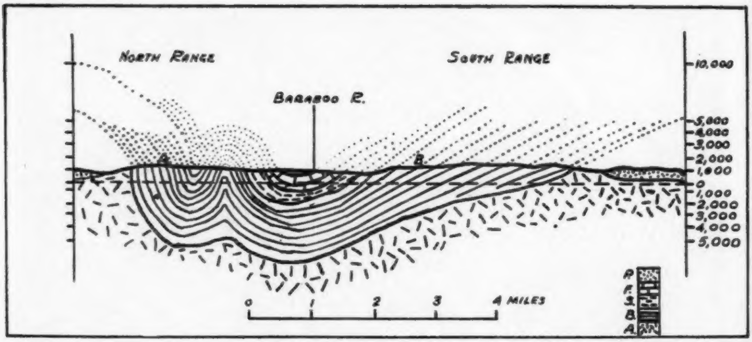


FIG. 4.

Major Folds of the Baraboo District. (After Salisbury and Atwood)

A. Van Hise Rock.
B. East Bluff Outcrop.

LEGEND

P—Potsdam sandstone.
F—Freedom dolomite—(iron-bearing)
S—Seeley slate
B—Baraboo quartzite
A—Archeozoic intrusives.

By applying these same principles to the structural features of Van Hise Rock, we find that it is on the north limb of a syncline. The massive light bed on the right has moved up relatively to the schistose dark bed on the left as is indicated by the direction of the drag in the fractures. A thorough discussion of fracture cleavage and the other structures of this district will be found in Chapter VII of "Structural Geology" by Dr. L. K. Leith.

Considering the area as a whole, then, it will be seen that the Baraboo district consists of two ranges trending approximately east-west, the north limb of which dips steeply to the south, and the south limb of which dips gently to the north. There are a few minor plications within the basin also, so that a large asymmetric synclinorium is formed. (See Figure 4.)

Two formations are prominent in this region: the Baraboo quartzite and the Potsdam sandstone. The latter rests on the former, the contact being an excellent example of an erosional unconformity.

The Baraboo quartzite is Huronian in age and the Potsdam sandstone belongs to the Cambrian system. Many other very interesting geological phenomena are found in this small district and can only be fully appreciated after considerable time has been spent in the field. Few localities surpass the Devil's lake area in the multiplicity and variety of geologic details, as well as in its famous scenic beauty.

The Collector, an interesting little magazine published by Glenn Hage, at Franklin, Minn., is extending to us their wholehearted cooperation in our contest by canvassing votes among its many readers. **The Collector** is a 16 page publication and devoted to stamps, coins, curios, Indian relics, and other items of interest. It is issued monthly. Sample copies are 5c; by the year, 50c.

The Jeweler's Circular, a prominent magazine issued for jewelers, commenting on our contest in their October issue, say, "—The suggestion has been made that a third subject be added to the ballot, namely, "gems," to determine what the national gem of the United States should be. There is only one gem, the garnet, in the list of minerals submitted on the ballot."

We Want Your Vote
In The
National Rock and Mineral Contest

The great contest is on. From sunny California to the rock-bound coast of Maine, votes are pouring in steadily and increasingly. It is too early as yet to give figures; suffice it to say that granite is way in the lead among rocks with marble and limestone in second and third place respectively. Gold has a slight edge of quartz, its nearest rival, with garnet not far behind in third place for the minerals.

Some of our friends have been so kind as to submit letters, notes or comments with their ballots and we are printing herewith excerpts from a few of them.

"—I think it probable that gold will receive the largest number of votes for our national mineral, and I can imagine the sarcastic remarks from other countries when the result is announced. It is perhaps appropriate that it should be chosen in view of the fact that we seem so often to consider it of more importance than human life. Fitting as it may be as the symbol of a nation whose government reports at the same time 24 individuals with incomes of over $5,000,000 a year, 6,000,000 children suffering from lack of food, and a wheat surplus that can not be disposed of, I cast my vote for quartz. This humble mineral has a name that is free from taint. It is so common that every child is familiar with it. Its uses in the arts and industries are multitudinous. Its crowning triumph will be the new 200 inch telescope mirror. This will enable the mind of man to soar far from this earth with its sordid greed for gold and roam through the unthinkable vastness of intergalactic space. Let us hope that the exaltation of spirit brought by the contemplation of millions of island universes will hasten the time when the symbol of selfish commercialism will no longer be appropriate as our national mineral."—W. Scott Lewis.

"—I took the matter of the contest up with Dr. U. S. Grant, Head of the Department of Geology, Northwestern University. He will be very glad to have the students vote in the contest for a national rock and mineral. He suggested, however, that only the students who have had a term or more of geology should vote. According to this there would be about 75 to 100 eligible to vote now. Those beginning the course now could vote at the end of the first term, next January. There would be about 500 voting at that time. Dr. Grant's wholehearted support was very gratifying and I am glad that you are to have it."

—Frederick Shepherd.

"—Enclosed please find samps to cover the cost of mailing to me 200 ballots which I will distribute among my friends. I am going to beat the record of 100 votes sent you not long ago and thus place Hanover in the lead."

—Kenneth Renoll, Hanover, Penn.

"—What shall be America's National Rock and Mineral? The Maine Mineralogical and Geological Society is actively engaged in a movement to find out by vote of its membership and through the co-operation of persons interested, the rock and mineral typical of the United States.

Ballots will be mailed to all persons interested from the office of President Herbert M. W. Haven, 500 Forest Ave., and the ballots will be forwarded to the ROCKS AND MINERALS Magazine, sponsor of the movement."—Portland Press Herald, Sept. 30th., 1931.

Every ballot counts. Induce your friends and acquaintances to vote. **Ballots may be had on Application.**

Field Museum Notes and News Items

Contributed by

THE FIELD MUSEUM OF NATURAL HISTORY

Chicago, Ill.

The extent to which Field Museum has progressed toward building up complete collections representing the various branches of the science of geology is outlined in an article by Dr. Oliver C. Farrington, Curator of Geology, published in the October issue of **Field Museum News,** monthly bulletin circulated among the Museum's thousands of members.

The minerals of the world are now represented at the Museum by some 33,000 specimens, varieties of rocks by 9,000, ores and non-metallic products by 26,000, and fossils by 122,000 specimens, Dr. Farrington points out.

"Special collections among the mineral species include those of gems and crystals," writes Dr. Farrington." Meteorites, which by their fall continually add to the mass of the earth, are represented by the world's largest collection as regards the number of falls possessed. The moon, being a satellite of the earth, is represented by a large model. Models, relief maps and photographs also illustrate earth features too extensive to be shown in any other way. Other models illustrate the occurrence of ores and minerals and methods of extraction of valuable products from them. In addition to exhibits of fossils in the forms in which they are found, life-size restorations of some of the animals of the past, of early man, and of trees and plants of the coal period have been prepared, while typical scenes of past geological periods are represented by twenty-eight large mural paintings."

A large assortment of petroleum yielding rocks and sands from widely scattered localities is on exhibition in the department of Geology at the Museum. The specimens are of extremely varied character, and represent fields which yield from four to 3,000 barrels a day.

A publication describing a hitherto unknown species of fossil turtle from Peru has been issued in the geological series of the Museum. Karl P. Schmidt, Assistant Curator of Reptiles, is the author.

A fossil alligator-like reptile of a species previously unknown to scientists is described in a new publication of the Museum. Bryan Patterson, of the staff of the Museum's department of geology is the author.

Thirty-eight specimens of fossil mammals, two of fossil turtles, and six skeletons of modern mammals were collected by the recent paleontological expedition to Nebraska for the Museum, led by Associate Curator Elmer S. Riggs. Among these were a number very desirable as additions to the Museum's previous collections of prehistoric mammals. Mr. Riggs was accompanied by several other museum men, including Bryan Patterson, James Quinn and Sven Dorf. The expedition was financed by the Marshall Field Fund.

It is now possible to see the various gases of which the air one breathes is composed by means of a new and unique exhibit just installed at the Museum. In this exhibit the gases have been segregated in separate tubes, and made visible by passing an electric current through the tubes, thus producing the characteristic spectrum of each . . . . brilliant blues, reds, oranges, yellows, greens, and other colors.

The gases, eight in number, are shown in the order of their quantity in the atmosphere. This order begins with nitrogen, which is the most abundant, and is followed by oxygen, argon, hydrogen, neon, helium, krypton and xenon.

"Previous to 1894 the composition of the atmosphere was considered to be about four-fifths nitrogen and one-fifth oxygen, with a small percentage of carbonic acid gas and traces of water vapor, hydrogen and ammonia," says Dr. Oliver C. Farrington, Curator of Geology, who designed the new exhibit. "Later experiments brought proof of the presence of five new gases, which were not known to exist in earlier days.

These new gases form but small parts of the atmosphere. Argon constitutes about one per cent by volume; neon about one part in 80,000; helium about one part in 250,000; kryton about one part in two million; and xenon one part in seventeen million. However, several of these have proved to be of much commercial importance. Argon is now used to fill electric light bulbs, having been found more satisfactory for this purpose than nitrogen, which was previously used. Neon, owing to the brilliancy of its spectrum, is now widely used for illuminating signs. Helium, because of its lightness and non-inflammability, has proved ideal for filling airships and balloons. Other commercial uses are made of some of these, and in addition they have been the means of obtaining much new knowledge which has had a profound influence on chemical and physical science."

A remarkably well-preserved skull of a prehistoric woolly rhinoceros has been received at the Museum from the Royal Museum of Brussels, Belgium. The specimen has been placed on exhibition in Ernest R. Graham Hall of the Museum.

The woolly rhinoceros was common in Europe and Siberia as a member of the fauna of the third glacial period, according to Elmer S. Riggs, Associate Curator of Paleontology. It was related to the so-called white rhinoceros of Africa, and was of about the same size. It was characterized by a thickening of the bones of the nose to support a long horn which was directed forward. A lesser horn arose from the face closely behind the first. The body was covered with a heavy coat of woolly hair which enabled the animal to endure the extreme cold of the glacial period. These rhinoceroses became extinct before the end of the period.

Dust Explosions

—*By*—

EUGENE W. BLANK
State College, Pa.

. Finely divided coal, flour, sugar and various dusts form highly explosive mixtures with air or oxygen. This presents a serious industrial hazard and numerous explosions have occurred in factories from this cause. (1)

To illustrate the explosion of mixtures of dusts with oxygen is relatively simple and the experiment is highly spectacular. Place a layer of the dust, such as ground charcoal, at the bottom of a stout jar and direct a stream of oxygen into the jar so that the current of gas stirs up the dust. Apply a lighted taper to the mouth of the jar. A brilliant explosion will take place.

The explosion of charcoal dust in oxygen.

(1) D. J. Price, Jour. Chem. Ed., Vol. 3, Pages 1008-1017, 1926.

A UNIQUE PICTURE IN STONE

A fine example illustrating how various colored marbles may be cut out, blended, joined together and the whole polished to make pictures of artistic beauty and workmanship.

A product of The Kio Co.

A Unique Picture in Stone

The illustration appearing on the opposite page is a mosaic comprising 193 pieces of beautifully colored marbles, skillfully arranged and polished, and is an example of the artistic workmanship of The Kio Co., 235 E. 78th St., New York City.

In making up this mosaic, choice and naturally colored specimens from some of the world's noted quarries were used. America, Mexico, Australia, Italy, Greece, France and Belgium are some countries represented. The background is black marble from Belgium.

The original mosaic is 10x12 inches in size and framed and is a most attractive "picture".

Four varieties of calcitic marbles are used in the arts—the marbles proper, the fossiliferous marbles, and the deposits from hot and cold water solutions. The first two varieties are used for building and decorative purposes and for mosaics of rare beauty; the last two comprise the onyx marbles and are chiefly used for novelties and beautiful ornaments. The hot water deposit of onyx is known as travertine and most are porous and not capable of taking a fine polish. It is the cold water deposit, the true onyx, which is in keen demand throughout the world as it is generally translucent, easily worked and takes a fine polish.

It is the ease of working calcitic marbles (their hardness is 3-3½), their susceptibility of taking a fine polish, their beauty of coloring or banding, that makes this type of material in such keen demand in the arts and the finished product so greatly admired by lovers of real beauty.

MINERAL LOCALITIES INFORMATION DEPARTMENT

Members desiring information regarding minerals or mineral localities in the following states may obtain it by writing to the Collectors listed and enclosing a self-addressed stamped envelope.

Oregon, Southern Idaho, Northern Nevada	Dr. Henry C. Dake, 793½ Thurman Street, Portland, Ore.
The Oregon Coast, South and Western Oregon, Northern California, Southern Washington	John M. Tracy, 601 Orange Street, Portland, Ore.
Petrological Information in Central Eastern Iowa	Prof. Wm. J. H. Knappe, Curator, Wartburg College Museum, Clinton, Iowa.
Massachusetts	Edward C. Foster, 1 Kingsley Ave., Haydenville, Mass.
Pacific Southwest, especially Southern and Central California	Edwin V. Van Amringe, Department of Geology, Pasadena Junior College, Pasadena, Calif.
Western Connecticut	Wilbur J. Elwell, R. F. D. No. 4, Box 18, Danbury, Conn.

Interesting Localities and How to Reach Them

The Yuma Mine

—By—

FRED W. SCHMELTZ

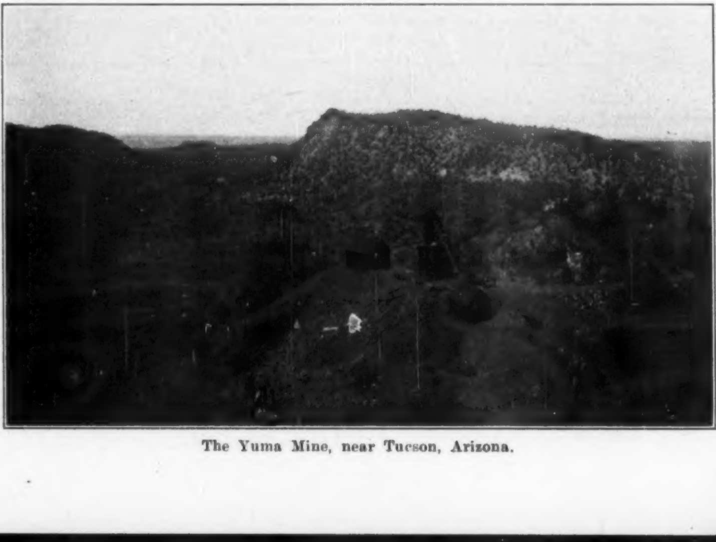
2510 Maclay Ave., New York, N. Y.

This mine, famous for its wonderful specimens of vanadinite and wulfenite, is located in Pima County, Arizona, approximately 15 miles northwest of Tucson. It can be reached from Tucson by going 14½ miles north on the Silverbell road, then turning left on the side road for a distance of 3 miles. At the junction is a small sign reading, "To picture Rocks."

Apparently the mine has not been operated for a long time, though the shaft is in good condition and a safe descent may be made, via the steps.

From the meager information available and my personal observations, lead was the chief ore mined with small quantities of silver. Copper and gold were also noted.

Editor's note:—This is the second of a series of little notes on some interesting localities of the West visited by Mr. Schmeltz during the early months of 1931. Mr. Schmeltz will be pleased to furnish additional information to all readers who may write him.



The Yuma Mine, near Tucson, Arizona.

Club and Society Notes

SAN FRANCISCO BAY REGION MINERALOGICAL CLUB

A rather unique mineral club was organized last May at Oakand, Calif., under the name of the San Francisco Bay Region Mineralogical Club. The club is small, consisting of only four young members, and is strictly amateur. Meetings are held once every two weeks. There are no dues. Two mineral excursions have been made so far, one to Livermore—which is south of Oakland, and the other to Marin County—which is across the Bay.

Only one office is held, that of President- Secretary, and is filled by Richard Sias. The official address is 824-55th Street, Oakland, California, and communications will be received with pleasure.

MINERALOGICAL SOCIETY OF SOUTHERN CALIFORNIA

The third meeting of the Society was held on September 1st at the Pasadena Library with 160 members and friends being present. The speaker for the occasion was Mr. William Russell of Koke-Slaudt & Co., Los Angeles, who gave a very fine talk on jade; many excellent jade objects, worth over $2,000 were displayed by Mr. Russell, and much admired by those present.

The Constitution, which had been prepared by a Committee, was adopted. Three directors were elected: Rene Engel, of the California Institute of Technology, David B. Scott of Altadena, and Dr. C. W. Shier of Arcadia. The name of the Society was changed from Southern California Mineralogical Society to the Mineralogical Society of Southern California. It was also voted that future meetings of the Society, beginning with the November meeting, be held on the second Monday of the month.

After the meeting had adjourned, many members remained for the purpose of discussing various mineralogical subjects, while those who brought specimens placed them on display or exchanged with other collectors.

The fourth meeting of the Society was held on October 2nd at the Pasadena Library with 160 members and friends being present. Dr. A. O. Woodford of Pomona College favored those present with a most interesting and instructive talk on crystallography. Many small glass models and three large models, illustrating the formation of crystals, were exhibited. One of the large models was lighted electrically.

A night class in mineralogy is being held every Tuesday and Thursday at Pasadena Junior College, Pasadena. Mr. Read, Instructor in Mineralogy, is teaching the class.

Kenneth Renoll, a high school boy of Hanover, Penn., is a real vote getter. His method is to carry a number of ballots with him and on meeting a friend or acquaintance to shove a ballot and pencil in his hands and say, "I want your vote". And he gets it too and on the spot. We believe he will easily break the record of 100 which is now held by St. Mary's School of New England, N. D.

The Amateur Lapidary

Conducted by

J. H. HOWARD*
504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones.* A practical guide-book written in untechnical language for those who desire to cut and polish semi-precious stones.

THE SUNFLOWER LAP

The Sunflower Lap is a most valuable device in making cabochon cut stones ready for polishing. As to my preparatory steps, I am using two operations, viz: No. 100 Carborundum wheel and No. 300 or No. FF Carborundum wheel. For wetting the wheels I use a five gallon can of water on a stand above the wheels. A copper tube is soldered to a pet cock near bottom of can. This tube is carried to side of wheel near arbor and contact made with side of wheel by a short piece of rubber tube. The grinding wheels are 12"x1½" and run at 600 r. p. m. After using both wheels, holding the stone by hand in both operations, the stone has a "satin" finish with no scratches nor bumps, if your fingers and thumbs have done a good job.

The stone is now cemented to the dop stick and made ready for polishing by the use of the Sunflower Lap. Make this lap in the following way:

Cut a rubber disc 10" in diameter from an automobile tube, or other thin rubber sheet, and cut a serrated edge 1" deep, see Fig. I. Cut arbor hole in center. Get from the Carborundum Company (Niagara Falls, N. Y.) 7" cloth discs of No. 180 Carborundum with proper size arbor hole. Wet the smooth side of the rubber disc and the back of the cloth disc with hot water. Press them together, lay a newspaper on top and put a flat weight on them over night. There is enough glue in the cloth to make it adhere to the rubber disc. The cloth disc may be cut from No. 180 Carborundum, sometimes available at wholesale or retail hardware stores. Put an 8" x1" wood lap on the arbor and at high speed, with a small wood chisel, cup the side of the lap about ⅜" deep. See Fig. II. The next "trick" is to properly install the rubber disc against the wood lap. An easy way to do this is to put the cupped lap on the arbor first. Then the rubber disc with its cloth face. Then put against the cloth face another plain lap. Tighten these by hand by the arbor. Cut a rubber band about 1" wide from a section of automobile tube. Stretch this over the front plain lap and "tumble" it back onto the cupped lap in such way that it holds the "petals" down firm and flat. Then remove the front plain lap and the trick is done.

You now have a yielding fast cutting surface on which to bring the stone to true curves and almost to complete smoothness. The surface is too coarse for use now. Take a large smooth stone of any kind, hold it against the surface

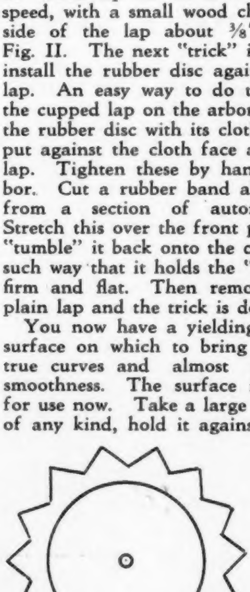


FIG. I

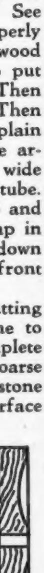


FIG. II

with wheel running at normal speed until you have smoothed down a white streak about an inch wide. Do your work on this white, apparently smooth streak.

Be sure to trim off any cement that is too close to the edge of the stone as cement will ruin this lap. The lap is used dry and the stone heats very fast and the cement may melt or the stone burn. The stone on this lap is given a quick, rotating, wiping motion. It must be cooled very often, probably each 10-20 seconds. A good scheme is to work 3-4 stones at a time laying them in a row on the bench, and grinding them alternately. I prefer a speed of 1000-1500 r. p. m. on this cloth lap and on the felt lap for polishing.

Each man must learn by experience just how much grinding must be done on this lap. If your work has been carried far enough on the fine Carborundum wheel this lap will finish about 30 stones. When it is worn too much to be used further, soak the disc in hot water to take the old cloth off and put a new one on.

I take my work directly from this lap to the hard felt lap with tin oxide for final polish.

L. E. BOWSER,
Bairoil, Wyo.

WHY THE FACETS?

The real principles of gem cutting, like the principles of most other physical operations, have been realized only quite recently.

For example, the recognized form of diamond cutting was for a long time a most simple design with four rear facets, and four front facets and a table. The only beauty of such a stone was in its symmetry and such "life" as the cutting accidently gave.

But with increased knowledge of the physical characteristics of light, the cutting of stones became a science.

There are two general classes of stones cut for personal adornment. One is the opaque or translucent stone, which depends for its beauty entirely on its color or its sheen. It is usually cut en-cabochon, and presents no problem to the cutter except to attain as pleasing shape and symmetry as possible with the shape and size of stone given him.

The other class is the transparent stone, some free from color and others with varying degrees of color. Some of these get their beauty from a combination of color and light reflection, while others, such as the diamond, are generally colorless and must depend for their beauty entirely on their ability to sparkle.

This sparkle is not inherent in the stone; it is put there by the cutter. When a ray of light strikes the crown of a transparent stone part of it is reflected off and part of it enters the stone, if it strikes it at a correct angle. That which enters the stone strikes the back surfaces. Here it is either reflected and comes back out of the crown, or if the angle at which it strikes the back of the stone is not correct it is refracted out through the back of the stone, instead of reflected, and does not come back out of the crown. A diamond that takes rays of light into its crown and does not reflect them out at the crown again is as dead as a piece of glass. In order to insure these reflections in the finished stone, the path of the ray must be calculated before the cut is begun and the angles of all facets so arranged as to bring the imput ray out the crown.

If it were not for the phenomena of refraction this calculation could be done once for all time and for all stones. But each kind of stone bends the rays to a different extent and this amount of bending of the ray when it enters the stone must be known before the angle of the facets are calculated.

J. H. HOWARD.

Mr. Charles F. Marble of Ridlonville, Maine, makes a suggestion that will occasionally prove quite useful. Where a small gemmy piece of material is to be removed out of a large specimen of poorer quality material, it can often be done in the following way. Put the specimen on the drill press table in a pan. Chuck in the drill press a piece of thin tubing, either brass or iron of the size of the piece of material you wish to remove. Start up the drill press and "saw" your gem specimen out with the thin tube, feeding to it constantly the carborundum paste and raising the tube from the work frequently in order that the paste may be always between the tube and the work.

Our Junior Collectors

Some Day They May Be Our Leading Mineralogists

PHILIP MILLER

Philip Miller of 6142 Harwood Ave., Oakland, California, is another young collector whom we wish to introduce to readers of ROCKS AND MINERALS. Though he has been collecting for only two years, his collection contains 424 specimens of which the major portion is from California but Nevada, Oregon and other sections of the Union are also represented.

Philip has made a number of mineralogical excursions and on one occasion he discovered three minerals and one rock in a section of California where these specimens were unknown and they were garnet, hornblende, selenite and eclogite (a very fine specimen of the rare rock, eclogite, was sent the Editor).

Since March, 1930, Philip has been a member of the Rocks and Minerals Association and intends to continue his membership for many, many years. He is also a member of the newly organized San Francisco Bay Region Mineralogical Club (see page 181).

Philip, who is the second of three sons of Dr. and Mrs. O. L. Miller, graduates this month from University High School and will enter the University of California in August, 1932, where he will enroll in the College of Chemistry. Congratulations, Philip, on your recent achievement.

Marjorie Williamson, a little Miss of ten summers or winters, and who lives in Oregon, is an ardent mineral collector. This little girl has over 50 minerals in her collection—many of which she collected herself.

In a recent letter to us, acknowledging receipt of our small collection of 10 different minerals in a neat box, she says in part:—"I like amethyst and garnet best but I think the little specimen of meteorite is more interesting." Can you imagine that! for a little girl of ten years to pick out the least attractive specimen in the lot and say it is more interesting than the rest.

We are very sure that many of our readers would consider it a pleasure to donate a few specimens to this delightfully interesting little girl and to encourage her in her fascinating study of minerals. We know little Marjorie would be very grateful and highly pleased to receive such gifts. Address her in care of J. R. Williamson, Richland, Ore.

Betty Youngman, a young lady of 14, has recently submitted an interesting little article on Copiapite, which we shall try to print in an early issue of ROCKS AND MINERALS. Miss Betty resides in Alameda, Calif. (See ROCKS AND MINERALS, Dec. 1930, Vol. 5, No. 4, P. 119)

Bibliographical Notes

Gems and Gem Materials:—By Edward H. Kraus, Professor of Crystallography and Mineralogy and Director of the Mineralogical Laboratory, University of Michigan, and Edward F. Holden, Late Instructor in Mineralogy, University of Michigan. Second Edition, revised and enlarged—260 pages, 325 illustrations. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y., Price $3.00.

Here is a book which should make a strong appeal to all lovers of gems. It describes practically every commercially important gem among which are many of the lesser known stones. Handsomely illustrated, written in a non-technical manner, revised and enlarged, with up-to-the-minute information about precious-semi-precious,ornamental-and manufactured stones, the authors are to be congratulated upon the issuance of this very interesting and very valuable publication.

Report of the State Geologist on the Mineral Industries and Geology of Vermont, 1929-1930: By George H. Perkins, State Geologist—265 pages, 39 figures and illustrations. Published by the Vermont Geological Survey, Burlington, Vt.

Of special value to mineral collectors in this interesting report is the chapter —List of Vermont Minerals, (pages 151-179)—which is arranged in two parts: Metallic and Non-metallic Minerals found in Vermont and each listed alphabetically together with a brief description of the minerals, their occurrence and localities where found in the State. This is the most complete list of minerals found in Vermont which has been brought to our attention and has been compiled by Mr. Perkins.

Tables and Charts of Specific Gravity and Hardness for Use in the Determination of Minerals: By Joseph L. Rosenholtz and Dudley T. Smith, Department of Geology and Mineralogy, Rensselaer Polytechnic Institute, Troy, N. Y.—83 pages, 29 charts, one straight edge.

A distinct departure in the methods of identifying minerals is the scheme outlined by the authors in this interesting bulletin which is based entirely upon the two important physical properties of minerals—specific gravity and hardness.

Ward's Natural Science Establishment, Inc., Its History, Reorganization, and Plans for the Future:—32 pages, 15 illustrations.

The purpose of this little booklet is to acquaint all workers in the natural field of science with the history, organization and staff of the Establishment and to announce that it has recently been reorganized along modern lines to increase its value to the education and scientific field. Seven departments comprise the Establishment and they are Mineralogy, Entomology, Microscope Slides, Maps and Models, Paleontology and Taxidermy.

This interesting little booklet is free and a copy should be in the hands of every collector. Send for your copy today. Published by Ward's Natural Science, Est., Inc., P. O. Box 24, Beachwood Sta., Rochester, N. Y.

An interesting discovery of volcanic bombs near Mono Lake, California, has been reported by W. Scott Lewis of Hollywood, California. The find was made in a crater which has erupted since the end of the glacial period, as shown by a study of nearby moraines. The bombs are of the "breadcrust" variety, with the characteristic surface produced by rapid contraction during the time the lava was being thrown through the air. In size they vary from tiny round ones only an inch through to large flattened masses two feet or more in diameter. All are very light, the most of them floating on water.

THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y., U. S. A.

Organized to stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not as yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

OFFICERS FOR 1931

Honorary President

Dr. Henry C. Dake, 793½ Thurman St., Portland, Ore.

Honorary Vice-Presidents

Dr. W. F. Foshag, Curator, U. S. National Museum, Washington, D. C.

Dr. L. J. Spencer, Keeper of Minerals, British Museum, London, England.

Dr. Bertha Chapman Cady, Girl Scouts, Inc., 670 Lexington Ave., New York, N. Y.

Charles W. Hoadley, Englewood, N. J.

Morrell G. Biernbaum, 17 Glencoe Road, Upper Darby, Penn.

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Edward Cahen, Birds Fountain, Dunsford, Exeter, Devonshire, England.

Secretary-Treasurer

Peter Zodac, Peekskill, N. Y.

Membership Department

New Members Enrolled—July 20—October 20, 1931.

THE HONOR ROLL FOR 1931

New Members Secured Since January 1st, by:

The Gem Shop, Helena, Montana	35
Edmund H. Cienkowski, Philadelphia, Pa.	25
John A. Renshaw, Arcadia, California	21
John W. Hilton, Thermal, California	10
Ward's Natural Science Est., Rochester, N. Y.	10
R. J. Santschi, Glen Ellyn, Illinois	9
James L. Riland, Meeker, Colorado	7

ALABAMA

Birmingham—Poor, Dr. R. S.

ARIZONA

Phoenix—Crumrine, D. C.
Long, Ralph S.
Winslow—Locke, H.

CALIFORNIA

Alhambra—Bird, David W.
Arcadia—Wetmore, E. A.
Carrville—Paymal, Geo. W.
Elk Grove—Sumner, Miss Florence A.
Fresno—Noren, C. A.
Glendale—Gulick, F. M.
Webb, William G.
Hollywood—Clark, Arthur B.
Huntington Park—Runyon, C. L.
Long Beach—Junior College Library.
Lightburn, Mrs. Geo.
Los Angeles—Wenger, Fred R.
Mt. Wilson—DeVore, Kenyon.
Palm Springs—Willard, Mrs. Stephen H.
Pasadena—Public Library.
Riverside—Schultz, H. C.
San Bernardino—Gergen, H. J.
San Francisco—Lux School.
San Gabriel—Calvert, Earl L.
Santa Ana—Scott, Horace A.
Santa Barbara—Santa Barbara Museum.
Schoepf, Harold A.
Solvang—Wulff, F. Charles.

COLORADO

Larkspur—Goazion, John

CONNECTICUT

Stamford—Richards, Ames.

DELAWARE

Wilmington—Foulk, Ferguson.

DISTRICT OF COLUMBIA

Washington—Balderson, Vearle W.
Bumstead, Albert H.

FLORIDA

East Palatka—Fisher, S.

ILLINOIS

East Moline—Ainsworth, Mrs. G. R.

INDIANA

Indianapolis—Children's Museum.
Michigan City—Johansen, Frederick L.
Valparaiso—Urschel, Joe.

IOWA

Alton—Barnett, Maurice.
Cherokee—Stiles, N. L.
Tama—Kirk, H. A.

KANSAS

Lawrence—Jones, Frank W.
Oswego—Stout, F. W.

MAINE

Freeport—Skillin, Edmund P.
Portland—Francis, P. Frederick.

MASSACHUSETTS

Cambridge—Lindgren, W.
Chelsea—Yaffe, Isadore.
Greenfield—Franklin, Henry H.
Lawrence—Germain, Dr. Albert E.
Milford—Gibbs, Kenneth F.
Newton Highlands—Jonah, Miss M.
Newtonville—Sawyer, Harry L.
Rockport—Lane, Roy.

MICHIGAN

Grosse Pointe—Colburn, William B.
Kalamazoo—Holmes, Albert.
Luna Pier—Shaver, Charles.

MINNESOTA

Avon—Grutsch, John.
Duluth—Smith, W. F.
St. Paul—Anderson, Wm. R.

MISSOURI

St. Louis—Grocott, W. H.

MONTANA

Billings—Hansen, Roy J.
Butte—Partelow, O. M.
Helena—Oker, Jos.
Sand Creek—McMahon, Ed.
Sidney—Sissell, Howard J.

NEBRASKA

Lancaster—Maryott, Miles J.

NEVADA

Mina—Ott, Henry D.
Reno—Uecker, Chris F.

NEW HAMPSHIRE

New London—Public Library.
Wolfboro—Mattison, Roger.

NEW JERSEY

Boonton—Fischesser, Miss M.
Glen Ridge—Taylor, James A.

NEW MEXICO

Albuquerque—Atherton, A. L.

NEW YORK

Auburn—Horoschak, Mrs. Mary.
Buffalo—Eno, Miss Esther W.
Mols, Dr. Joseph P.
Loudenville—Holmes, 2nd. Lemuel.
Mineola—Harzfeld, Stanley.
New York—Grott, Eugene A.
Peekskill—Hudson Valley Engineering Company.
Rochester—Denning, Reynolds M.
Spring Valley—Elliott, Jr., Matthew.
Tarrytown—Telfair, Peter.
Upper Jay—Smith, Mrs. Wallis C.
Yonkers—Collins, Whitney.

NORTH CAROLINA

Sapphire—Parsons, Dr. Chas. J. S.

OHIO

Columbus—Goodwin, H. R.
Tallmadge—Pitkin, Fred S.

OKLAHOMA

Lone Wolf—Lone Wolf School.
Norman—University of Oklahoma Library.
Tulsa—Blaise, E. F.
Edson, Mrs. Fanny Carter.
Mills, B. R.

OREGON

Ashland—McHattan, T. G.
Denio—Lubbinga, Jack.
Forest Grove—Chalmers, W. A.
Warbis, Fred.
Grant's Pass—Pollock, Eclus.

PENNSYLVANIA

Allentown—Bogert, Joseph C.
Klein, W. C.
Germantown—Rinehart, Jr., H. P.
Lancaster—Widmyer, John Henry.
Woerner, H. Ray.
Mount Carmel—DuPont, Marcel.
Upper Darby—Jr. High School Library

UTAH

Salt Lake City—Cruser, Reed.

VERMONT

Wilmington—Adams, Walter.

WASHINGTON

Oakesdale—Stoecker, Elbert.
Prosser—Ferris, M. S.
Seattle—Mackay, Ralph E.

WISCONSIN

Milwaukee—Leissring, Wm.

WYOMING

Douglas—Judy, Clayton.
Laramie—Lomicka, F. J.
Vorpahl, Adolph, F.

Canada

ONTARIO

Copper Cliff—Bowman, Ivan T.

Europe

AUSTRIA

Vienna—Boehm, Julius.

SPAIN

Vigo—deBorran, J.

Australia

NEW ZEALAND

Westport—Young, H. R.

The Sluice Box

By

A. RIFFLE

A feature writer in the July 11th issue of Collier's states, "Of the one hundred and three minerals known to American mineralogists, Arkansas produces all but one—borax." Old Bill says that he has dug that many out of one prospect hole and not found any gold at that. Anyway it would be interesting to know which one of you "old-timers" have the most American species and how great the total really is. Do a little checking up and send in the results to Rocks and Minerals for publication.

Nowadays most people are wondering how to make a dollar do double duty. Here is one way. Give subscriptions to Rocks and Minerals for Christmas. This way you are giving your friends real presents which will furnish them pleasure for a full year and at the same time help to put the magazine over. Figure all you want to and you cannot get more real value out of a dollar than by doing this.

Old Bill joins me in extending to the many friends and readers of Rocks and Minerals a MERRY CHRISTMAS and a HAPPY NEW YEAR.